Serving the CoCo Community for

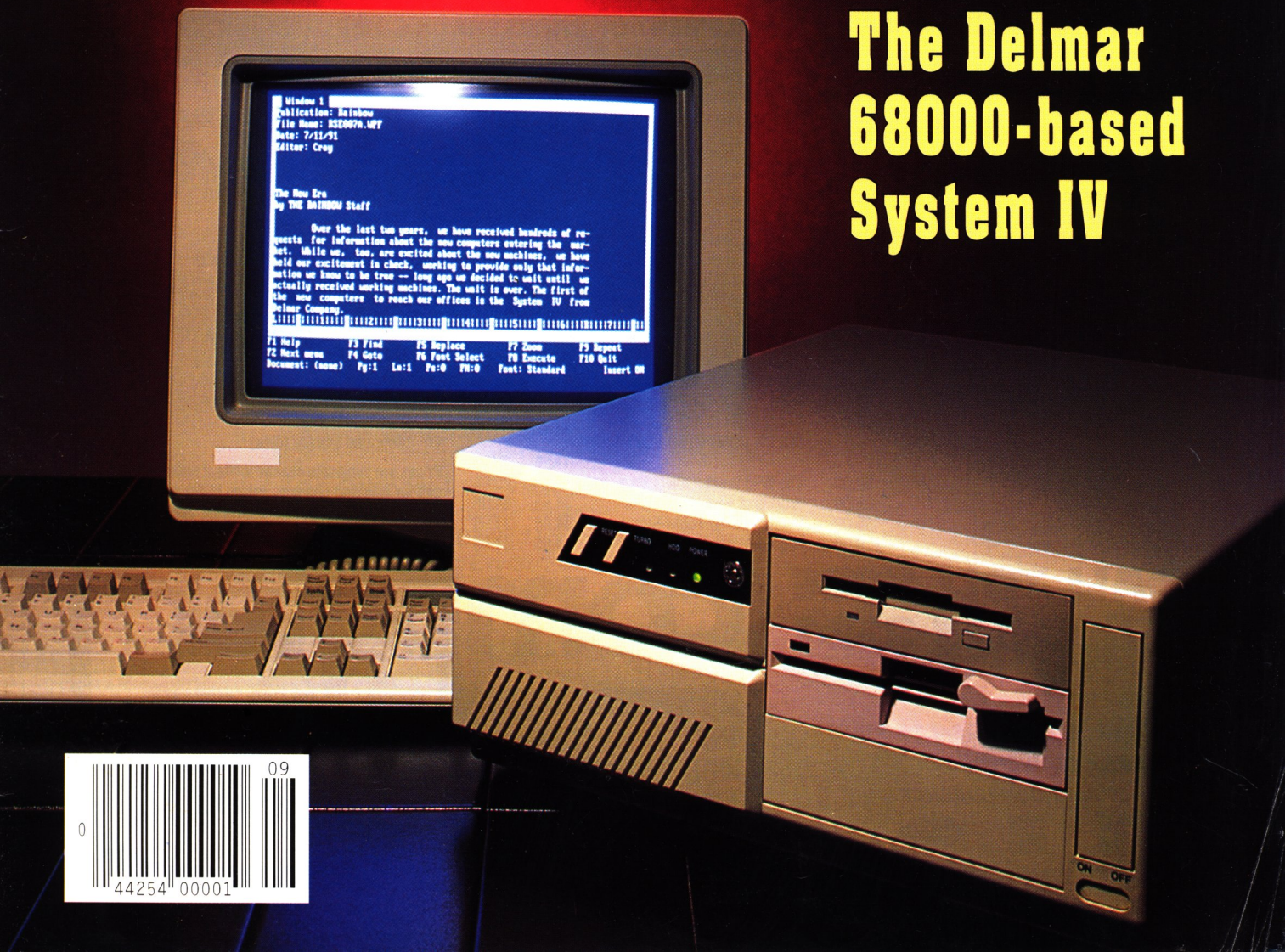
The RAINBOW® 11 YEARS

THE COLOR COMPUTER MONTHLY MAGAZINE

September 1991 Vol. XI No. 2 Canada $4.95 U.S. $3.95

# A New Era

## The Delmar 68000-based System IV


Window 1
Publication: Rainbow
File Name: RS20070.WPF
Date: 7/11/91
Editor: Crog
The New Era
by THE RAINBOW Staff
Over the last two years, we have received hundreds of requests for information about the new computers entering the market. While we, too, are excited about the new machines, we have held our excitement in check, working to provide only that information we know to be true -- long ago we decided to wait until we actually received working machines. The wait is over. The first of the new computers to reach our offices is the System IV from Delmar Company.
F1 Help F3 Find F5 Replace F7 Zoom F9 Repeat
F2 Next menu F4 Goto F6 Font Select F8 Execute F10 Quit
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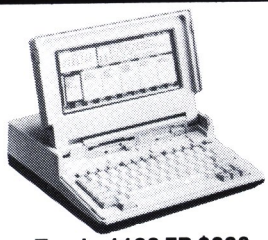

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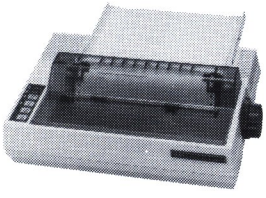

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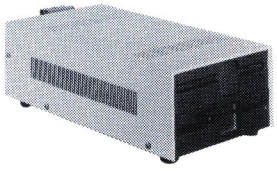

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# RAINBOW

11 YEARS

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The cassette tape/disk symbols beside features and columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE and RAINBOW ON DISK. Those with only the disk symbol are not available on RAINBOW ON TAPE. For details, check the RAINBOW ON TAPE and RAINBOW ON DISK ad.

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# Letters to the RAINBOW

## Assembly-Language Books

*Editor:*

I have a 128K CoCo 3, cassette player and the *EDTASM+* cartridge. I just got the *EDTASM+* cartridge recently. I enjoy assembly-language programing. The instruction book for *EDTASM+* mentions Wiliam Barden Jr.'s book, *TRS-80 Assembly Language Programming*, catalog number 62-2077. My local Radio Shack stores say the book no longer exists.

I was wondering if you knew where I could possibly get a copy of this book, or if any Rainbow readers have a copy they could part with.

Also, do you know of any other books on assembly-language programming for the CoCo. I know of the two books that Microcom sells, *Assembly Language Programming* and *Addendum for CoCo 3*.

*John Corey*
*117 Morton Street*
*Creve Coeur, IL 61611*

## Random Sorts

*Editor:*

I would like to offer a suggestion to those who want to randomize a list, as in shuffling a deck of cards. This technique avoids having to check each randomly selected number against all those previously chosen to avoid duplication. Set up an array containing the number of items to be randomized. Then proceed as follows:

```
10 FOR X=1 TO N:AR(X)=X:NEXT
20 X=X-1:R=RND(X):AR=AR(R):AR(R)
=AR(X):AR(X)=AR:IF X>2 THEN 20
```

This is very quick and works well for me. I don't know if it is familiar to others, but I have never seen it used in listings.

*Ross Chamberlain*
*New York*

## Cartridge Software on Disk

*Editor:*

In view of the fact that Radio Shack is selling most of its CoCo software at very low prices, I would like to take advantage of these sales. I do not have a Multi-Pak Interface, nor do I have the resources or the space to use a Multi-Pak. I would like to purchase some of the games, but I do not want to keep taking out the controller for my drives. The only solution to this problem is disk software. Can you advise me how to transfer these ROM paks to disk?

I would also like to make some suggestions for our magazine. I would like to see want ads or for sale ads for people like myself who are not giving up their CoCos. Some of the older software and hardware advertised in some of the past issues are no longer for sale. I am sure there are people like myself, where the first place I go when I am looking for something is to THE RAINBOW. Some of the things are still advertised and for sale and others are not. This would also be a good source of revenue for Rainbow to keep it in print a little longer. I realize there is a want ad area on Delphi but not everyone has a modem or can afford Delphi.

Another area I would like to see expanded is the letters to the editor. I would like to see the answers to the questions. Sometimes I have the same question. Maybe not at that particular time but at some time in the future that might be useful to know. I am sure there are other people out there who feel the way I do. As I mentioned, I am always searching THE RAINBOW for something and when I come across the very thing I wanted to know, someone else had already asked it, but the answer is not there.

*Virginia Frisino*
*135 LaSalle Street*
*East Longmeadow, MA 01028*

## Thanks for the Review

*Editor:*

I would first like to thank your reviewer, Jamie Hensen, for her nice and, at times, humorous review of my *NIB Swimsuits/Lingerie, Vol. I* (July 1991, Page 54). I would also like to point out that there are now 87 pictures in that five-disk collection, not the mere "more than 60," which was stated in the review. It should also be noted that the phone number has changed. It is now (503) 668-3173 (9 a.m. until 2 p.m. PDT weekdays). Additional NIB picture set information can be had by writing me at the address listed at the end of the review.

*Steve Ricketts*
*PO Box 1048*
*Fairview, OR 97024*

## The Illusive Review

*Editor:*

I read "Received and Certified" in the August 1989 issue. The first product was *4-D Chess* from Microcom. I looked through the later issues of THE RAINBOW to find the review and/or advertisement from Micro-

com, but I could not find anything that had to do with this product. I would like to know if it is still available and if there is a review in THE RAINBOW that maybe I missed.

*Matt Henning*
*Pittsburgh*

*For one reason or another,* 4-D Chess *was never reviewed and is no longer available through Microcom.*

### In Search of *EDTASM+*

*Editor:*

Is there anyone out there with a copy of *EDTASM+* they want to get rid of? I am willing to pay for it, plus shipping. Please write and let me know.

*Ryan Boughter*
*RD #2, Box 554*
*Barto, PA 19504*

*The last time we checked, Radio Shack's Express Order Service had limited quanities of* EDTASM+ *in stock. You can contact Express Order by dialing (800) 321-3133.*

### Crash and Burn

*Editor:*

I have *Z'89* by Steve Bjork, and I can't seem to enter the game. I get to the screen where it asks me what type of monitor I have, then it goes to the graphics screen where it displays its name. After that the screen lifts a little bit and it returns to Disk BASIC. Do you know of any way to get past that, or do I have to replace that disk?

Could you suggest a cheap, but good disk editor (and utilities). I could use one that has a lot of features.

*Aaron Sebold*
*5270 Glade Chapel Road*
*Hillsboro, MO 63050*

### In Search of a Rumor

*Editor:*

I have heard rumors of an updated *GETerm* for some time and with the CoCo Consultants section maybe help is near.

I use Version 1.1 to run a TNC on amateur radio. I wrote to T&D Software and to Greg Miller himself without an answer.

Since my interests are with amateur radio, I do not have a modem and am unable to access Delphi. Marty Goodman's comments state it is shareware, so where else may I get a copy?

*George Sturm*
*HC 62, Box 183K*
*Durant, OK 74701*

*The latest version of* GETerm *released is Version 2.5. According to the information available on Delphi, you can order* GETerm *by sending $10 to Greg Miller, 9575 Royston Road, Grand Ledge, MI 48837. However, we cannot confirm whether or not that address is current.*

### Recovering Tape Software

*Editor:*

I am relatively new to the CoCo world and so have some questions on how to better use my equipment. I have a CoCo 3, CM-8 color monitor and a CCR-81 cassette recorder. I use Tandy computer cassettes exclusively.

My problem is that after entering a listing and saving it to tape, I can't recover the program from the tape. All I get is an I/O error. This happens mostly on longer programs. As you can imagine it is very frustrating. I would appreciate any help you can give me.

*Robert Malloy*
*1116 Pine Street*
*Freeland, PA 18224*

*Check the cassette cable to ensure it is in good condition. If any of the wires look frayed or broken, you should purchase a new cable. Also check the placement of the cassette player. If the cassette player is near the right side of the TV or monitor, it could be picking up noise from the high-voltage transformer in the TV or monitor.*

### Kudos

*Editor:*

I would like to publicly thank everyone at THE RAINBOW for consistently producing a magazine that has provided me with entertainment, and far more importantly, education. Were it not for THE RAINBOW, and if my educational resource were lift up to Tandy, I would have trashed my CoCo not long after purchasing it. Instead, I got years of very productive enjoyment out of my CoCo!

I would like to thank Rick at Performance Peripherals, Zack Sessions, Dave at CoCoPRO! and Greg Law at Rainbow; all of whom have helped immeasurably on a personal basis. I would also like to thank the vendors of CoCo products. Were it not for all of you, the CoCo would have been little more than a game machine.

One last note. Upon receiving my Hewlette-Packard Deskjet 500, I noticed that it has a built-in serial port alongside the parallel port! Although I know of no CoCo graphics-based software that includes drivers to run this printer, it would be an outstanding choice for those most interested in word processing. Having both ports will allow direct connection to a CoCo, and yet still connect directly to your next computer. Had I known, I would have bought one long ago.

*Charles Phillips*
*Laurel Bay, South Carolina*

### Sweating to the Chips

*Editor:*

On Page 44 of the May 1991 issue, Marty Goodman talks about replacing three parts of the CoCo in an effort to keep the computer from overheating. The parts are a heat sink, a transistor and a power supply.

Recently my CoCo burned out and I picked up a new one and another used. Both have 512K and both run quite hot even for short periods of use.

I'm interested in making the modification Mr. Goodman talks about. What I'm looking for are the Radio Shack catalog numbers for these parts. As you probably know, putting a fan in one of these computers is difficult as there is not a lot of room.

*Ernest Bazzinotti, Jr.*
*93 Auckland Street #2*
*Dorchester, MA 02125*

### Kudos to Rainbow

*Editor:*

Please enter my name to your list of satisfied customers and renew my subscription to your magazine. Without the help given freely by so many people who believe in the CoCo, I would have given up long ago. So not only to your faithful writers and staff but also to all who so unselfishly share their talents I would like to express my thanks.

*Clifford De Boer*
*Racine, Wisconsin*

### The Endless Circle

*Editor:*

When I, along with my partner, formed Sub-Etha Software last year it was a dream come true. One of my original reasons for buying a Color Computer was to write software for the machine. I soon stumbled across a 300+ page magazine that showed more items for my new little machine than I could ever hope to own and thus my quest for programming greatness ended.

As you may have guessed, this was some time ago. One of the reasons I think many people are taking the shrinkage in THE RAINBOW as such a bad sign is because these die-hard enthusiasts remember grander and greater days.

Well, some really dedicated CoCoists might recall two other CoCo publications: Hot CoCo and Color Computer Magazine. In the great hey day of the CoCo market (even before there was a Color Computer 2) Color Computer Magazine was around 128 pages and Hot CoCo ran about 96 pages. (These examples come from an August 1984 and 1985 issue, respectively.) As you can see, in our so-called "final years" after Tandy has dropped support for our beloved machine, THE RAINBOW still fairs well compared to the others back then.

# Submitting Material To Rainbow

Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs that are useful, helpful and fun for other CoCo owners.

**WHAT TO WRITE:** We are interested in what you want to tell our readers. We accept for consideration anything that is well-written and has a practical application for the Tandy Color Computer. If it interests you, it will probably interest lots of others. However, we vastly prefer articles with accompanying programs that can be entered and run. The more unique the idea, the more the appeal. We have a continuing need for short articles with short listings. These are especially appealing to our many beginners.

**FORMAT:** Program submissions must be on tape or disk, and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs and debug our typing errors. All programs should be supported by some editorial commentary explaining how the program works. We also prefer that editorial copy be included in ASCII format on the tape or disk, using any of the word processors currently available for the Color Computer. Also, please include a double-spaced printout of your editorial material and program listing. Do not send text in all capital letters; use upper- and lowercase.

**COMPENSATION:** We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those wanting more detailed information on making submissions, please send a self-addressed, stamped envelope (SASE) to: Submission Guidelines, THE RAINBOW, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. We will send you comprehensive guidelines.

Please do not submit material currently submitted to another publication.

Hot CoCo eventually merged back into 80 Micro (where it was originaly just a monthly column) and Color Computer folded. THE RAINBOW, on the other hand, survived due to the support the CoCo Community gave it. THE RAINBOW still needs that support.

Let's break our paranoia down a bit further. Today we worry about the size of THE RAINBOW. Ever look at the size of some other computer magazines for systems such as the CoCo? Come to think of it, have you even seen a publication for a Commodore 64 or Atari 8-bit lately?

Next, we cry out "Tandy has dropped our machine!" Yes, they did... several years ago. The CoCo 3 came out in 1986, then we were given OS-9 Level II and a Hi-Res joystick gadget. From 1988 on, what did we get? Some new games. A few new ROM paks. And don't forget the new printers and pistol grip joystick, which conveniently also worked with the Tandy 1000 family. Great support, eh?

What seems to have hurt the CoCo Community the most is ourselves. We stopped believing. While virtually every other 8-bit computer system faded into nonexistance, we panicked when our CoCo publication started to shrink. Subscriptions to THE RAINBOW "pamphlet" were not renewed. With a lack of readers to buy products advertised came a reduction of sales, which caused a reduction of advertisers, which caused a reduction in the size of the magazine, which, well, you get the idea.

Now for the punchline. What can *you* do to help? Simple. To help ensure more years of CoCo support I propose a few simple steps.

1. Subscribe to THE RAINBOW. Period. THE RAINBOW made the CoCo what it is today, and without it we are lost. Sure, modems bring a relatively small part of the community together, but what about the rest of us? And the vendors?

2. Support us, the vendors. Buy our products and stop piracy. Without sales we cannot afford to advertise. Without advertising, THE RAINBOW cannot afford to publish. Get the picture?

It's up to us. Let's not let ten years of Color Computing go to waste.

*Allen Huffman*
*Sub-Etha Software*
*P.O. Box 152442*
*Lufkin, TX 75915*

### The OS-9 Headache

*Editor:*

A couple of years ago, I obtained OS-9 Level II and attempted to learn how to use it. Unfortunately, I was unable to master it or its various functions. By the way, many years ago, I used the CoCo 1 and CoCo 2, at one time or another, and now have had two CoCo 3s for quite a few years.

In trying to learn more about the programs, I wrote letters to THE RAINBOW and got little, or no, information of a helpful nature. I then wrote to the author of the program with not even the courtesy of a response. As a result, I have used my CoCo 3 more then ever, but mainly for writing a ham radio related newsletter and magazine articles and maintain my normal business and personal letter writing and kept very busy with the CoCo 3.

I also, at the same time, decided that I could do much better if I got rid of the OS-9 headache and used what I had at hand, such as *CoCo Max 3*, *VIP Writer* and several other programs.

Recently I renewed my subscription to THE RAINBOW, but it would appear that the magazine is getting smaller, or thinner, each month and concentrating on OS-9 and Delphi to more or less the exclusion of people who use non-OS-9 programs. Yes, there are a few programs and articles for these people, but more and more about Delphi and OS-9 each month.

I shall keep the latest subscription intact, at least until it runs out, but I retain the opinion that THE RAINBOW simply does not support the users of Extended BASIC any more and is certainly on the way to oblivion, slowly but surely.

*M. L. Braun*
*Bellevue, Ohio*

**THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.**

**Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type RAI to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type LET to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.**

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# The Three R's

The oldest "themed" subject of any of the magazines we publish is that of education. In our very first year publishing THE RAINBOW, we set the September issue on a "Back To School" theme and have stayed with that ever since. As PCM has grown and evolved, it, too, has traditionally focused on education as the primary subject of its September issue.

Education, of course, has a very broad range — from the outlook of teachers to the outlook of students. Then, too, the outlook of administrators, parents, consultants, "specialists," etc., seems to play a part in the general subject of education.

Over the years, of course, this has presented small problems for us since we have consistently attempted to address all of those areas of interest. At times I have thought we get too far afield and end up with authors stating general positions of what "should" or "should not" be taught rather than trying to help in the actual teaching.

Indeed, with all of the computer capabilities available today, it is almost a red flag to mention using a computer to "drill" students. I wrote about this subject a year ago and remain convinced that while not jazzy, using computers for drill greatly enhances learning skills.

I believe, though, that as we move more and more into the electronic classroom environment, we sometimes lose sight of the fact that the most important element of the education process is the teacher. I use the term loosely, since a teacher may be a person who presides over a nursery school class as easily as a person who lectures at a university.

Teachers greatly influence our lives. I remember 40-some years ago hearing my father, my Uncle Max and others talk about a Miss Thorton who presided over high school Latin in Birmingham, Alabama, in the early 1920s, as though it was yesterday. I marveled at the time that these "old" people remembered teachers. The interesting thing seems to be that I remember, just as well, many of *my* teachers. So I would like to pay tribute to teachers in this year's education issue by recalling some of mine. And whether you are 9 or 90, I hope this will occasion you to remember some of your teachers, too.

How important *are* teachers? How important were Mable Eckerle and Virginia Dierking at North Glendale School in St. Louis?

Mrs. Eckerle taught me to write in cursive in the second grade (and also tried to teach me to like apples). When we were learning the letter r, I put that together with t and e to spell tree, the first word I ever wrote! Was Mrs. Eckerle proud of me? She pointed it out to the whole class. And made me *really like* writing things down. Imagine how different things might be had I *hated* to write?

Mrs. Dierking exposed me to creativity and, I am sure, suffered vastly through my attempt to write a short story in sixth grade about a cursed mummy's ring. She also tried to teach me to draw, an attempt at which our art department here at Falsoft will testify she failed. Nevertheless, Mrs. Dierking showed me I could express ideas on paper. I consider this the most valuable asset any teacher ever gave me.

Obviously, I am a creative person and not much into math and science. Those who know me say I like computers simply because they serve as vast adding machines, a function I cannot perform in my head. Thus, my list here is short of science and math teachers, not because they were not good, but because my interests lay elsewhere.

Except, of course, for Miss Mayme Bagley of Crestline School in Birmingham who taught seventh and eighth grade science. That I learned about how steel was made, and what kind of foods to eat to keep from getting pellagra and scurvy, is beside the point. Miss Bagley taught the Great Lessons of Life to every child who crossed her path. Since no one wanted her to "jerk a knot in you," we learned those lessons — and abided by them, too.

When, on a dark and cold January day Miss Dinnie Mae Mackey turned off her classroom lights and acted out the first act, first scene from *Macbeth* for her senior English students at Shades Valley High School in Birmingham, everyone knew something special was afoot. What was special was Miss Mackey, who taught with such zest and gusto you really never realized she was requiring you to practically memorize great poetry from *Beowulf* to *The Hollow Men*. Hers was the most difficult final exam I ever took. And through four years of college I never had to memorize anything else because I had already done it for Miss Mackey.

American literature was Gene Jones' specialty at The University of Alabama, but it was his ability to relate the lessons of literature to life that made him a very special teacher. Walter Koch, an amazing intellectual talent, taught geography, and I even considered majoring in that area simply because I liked his classes so much.

Vernon Grosse proved to most of his students that the saying "past is prologue" is an excellent reason to study history of all kinds, but his two-semester "Cultural and Institutional History of the Christian Church" was such a *tour de force* it should have been a required course. J.B. McMinn's philosophy classes were on a higher plane — he freed our intellectual feet from the earth and taught us to *think*. Can anything finer be said of a teacher?

While reading one of Irving Wallace's *Book of Lists*, I once thought the only problem was the lists were all too short. And so it is with this one, which excludes Miss Goostree, my kindergarten teacher; Mrs. Becker who taught me to read in first grade; Miss Almon, who was a grand teacher of social studies; Mr. Legg and Mrs. Maxwell who *tried* to get me to understand numbers; Dr. Ramsey, an excellent historian; Dr. Menning, who "wrote the book" on business communications and Capt. Lawrence, who taught much, much more than Military Science and Tactics.

Whether you have long completed your schooling or are in the midst of it, I am sure you have your own list, too. So, before you delve into this issue, I hope you will take just a moment to think a little thank you for the Miss Mackeys and Mrs. Dierkings who added so much to your life.

**— Lonnie Falk**

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# THE NEW ERA

Window 1
Publication: Rainbow
File Name: RSE9070.WPT
Date: 7/11/91
Editor: Crey
The New Era
by THE RAINBOW Staff
Over the last two years, we have received hundreds of requests for information about the new computers entering the market. While we, too, are excited about the new machines, we have held our excitement in check, working to provide only that information we know to be true -- long ago we decided to wait until we actually received working machines. The wait is over. The first of the new computers to reach our offices is the System IV from Delmar Company.
F1 Help F3 Find F5 Replace F7 Zoom F9 Repeat
F2 Next menu F4 Goto F6 Font Select F8 Execute F10 Quit
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Over the last two years, we have received hundreds of requests for information about the new computers entering the market. While we, too, are excited about the new machines, we have held our excitement in check, working to provide only that information we know to be true — long ago we decided to wait until we actually received working machines. The wait is over. The first of the new computers to reach our offices is the System IV from Delmar Company.

It is important to note right up front that the System IV is not a CoCo, nor was it ever intended to be. It does not support Disk BASIC, and for the most part, it won't even directly run software written for the CoCo.

The System IV is a computer built around the Motorola MC68000 microprocessor (a big sister to the 6809 in the CoCo) and is delivered with Microware's Professional OS-9/68000 operating system. The 16-MHz speed and wider data bus of the 68000 mean the programs you use on it will run quite a bit faster. Of course some of the software we have used on the System IV is a bit more complex, too. The multiuser, multitasking capabilities of OS-9 make the system ideally suited for the professional market where small businesses can take advantage of centralizing data for databases and spreadsheets. With the stock System IV, you can quickly connect up to four external terminals (the CoCo 3 works well for this), allowing up to five people to run different programs on the same computer at the same time. Still, single users can benefit from the increased speed and the ability to run multiple programs simultaneously.

Equally as important, the System IV is designed to be easily and inexpensively expanded. In a somewhat unique approach, the PT68K4 motherboard (developed by Peripheral Technology) sports seven PC/XT-compatible expansion slots. This means you can go to your local computer stores and purchase standard 8-bit expansion cards intended for MS-DOS machines and plug them into the System IV. Video, drive-controller and I/O cards are readily available at low cost in most areas. For example, the system we received for evaluation uses a PC-compatible WDXT-GEN hard drive controller and a standard VGA video card. At the RAINBOWfest in Chicago this past April, we watched (heard) the System IV as it played sound through a Soundblaster PC card. In addition to providing a relatively inexpensive expansion path for System IV users, the flexibility of this approach is a boon for those who already have an MS-DOS machine or who plan to purchase one in the future.

A disadvantage, though not particular to this machine or its approach, is that you may have to write your own OS-9 driver software to support any cards you add. OS-9 requires a driver/descriptor pair for each device in the system, and there are a lot of devices out there. However, Ed Gresick, owner of Delmar Company, informs us that drivers for standard PC-compatible serial cards and the Colorado QIC-40 tape drive are currently being developed. The System IV is delivered with OS-9 drivers and descriptors for a printer port, four serial ports, Hercules and VGA video and a 20-Meg hard drive with the WDXT-GEN controller. However, Delmar provides a preconfigured device descriptor for the hard drive included with the system. You can use utilities provided with OS-9/68000 to alter these descriptors to fit other requirements.

### How It's Packaged

The System IV motherboard comes in an attractive mini-PC case, complete with a 200-watt power supply. There is room in the case for up to five drives — three 5¼-inch, half-height and two 3½-inch drives. One of the 3½-inch drive bays is designed for an internal hard drive. Included on the motherboard are one megabyte of memory (DRAM), two parallel ports, four serial ports, a high-density floppy-drive controller and an XT-compatible keyboard interface.

Delmar Company is currently offering the System IV in two basic forms: The Terminal system ($999) and the Console system ($1149). The Terminal system includes one high-density floppy drive (your choice of 5¼-inch or 3½-inch) and Professional OS-9/68000 (which includes the Microware C Compiler). This setup is very attractive to users wanting or needing the power of the 68000 at the lowest possible cost. While it doesn't have a video board, a monitor and a keyboard, it is fairly easy to connect another computer (a CoCo or per-

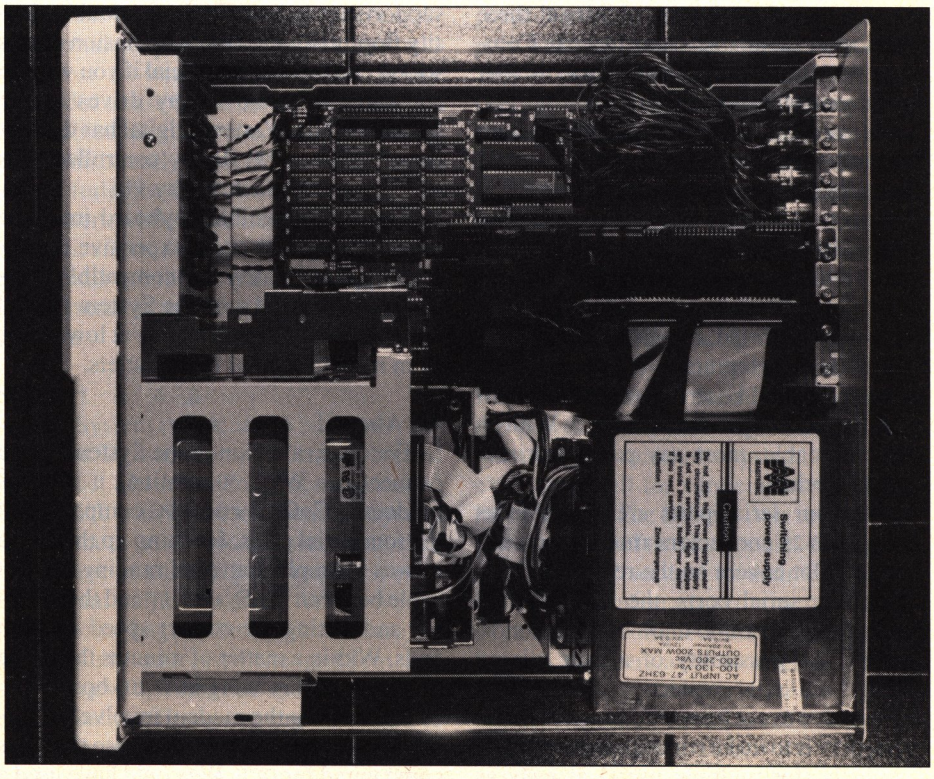


**Photo 1: System IV Motherboard**

haps an MS-DOS machine) as a terminal and get the same use from the System IV. This offers users in the CoCo Community a less expensive way to ease into the 68000. We'll take a closer look at connecting terminals in a moment. The Console system is the same as the Terminal system except that it includes a VGA graphics card (without a monitor) and an Enhanced 101-key keyboard. Any 83-key or Enhanced 101-key keyboards that can be switched to XT-mode works with the System IV.

The system we received for evaluation is an expanded Console system with four megabytes of memory, a Western Digital WDXT-GEN hard-drive controller and Seagate ST251-1 hard drive, and a Sunshine VGA color monitor. Several graphics images and a slide-show program to view them were included on the hard drive we received. Our first plug-and-run session with the System IV was very exciting.

### A Closer Look ▲ ▲ ▲

For individual users, the included one megabyte of memory should be enough for most purposes. None of the software we tried required more than this. However, serious users and programmers will want more to allow for the disk cache and RAM disk features of OS-9/68000. And systems intended for multiple users will need more memory to support the various programs those users might want to run. The motherboard has sockets for an additional three megabytes (available from Delmar Company for $160), bringing the total to four megabytes of onboard DRAM.

Connection to the first parallel port on the motherboard is made through a female DB-25 connector mounted on the rear of the System IV just below the power cord. The port is designed to accept an IBM-compatible printer cable — standard fare at computer stores. The second parallel port is not currently supported, but an updated driver is now in development. We connected a Hewlett-Packard LaserJet printer to the first port, and had no problems using it. With an IBM-type cable, most any parallel printer should work.

The four serial ports are available as female DB-25 connectors mounted on expansion-slot covers on the rear of the machine. For serial ports, the IBM standard uses either male DB-25 or DB-9 connectors to prevent the possibility of a user mixing parallel and serial connections. We suspect the decision to use female connectors on the System IV is to make connection to external terminals (for multiple users) as easy as possible. Fortunately the serial and parallel connectors are located on opposite sides of the case and are clearly labeled. This helps minimize confusion.

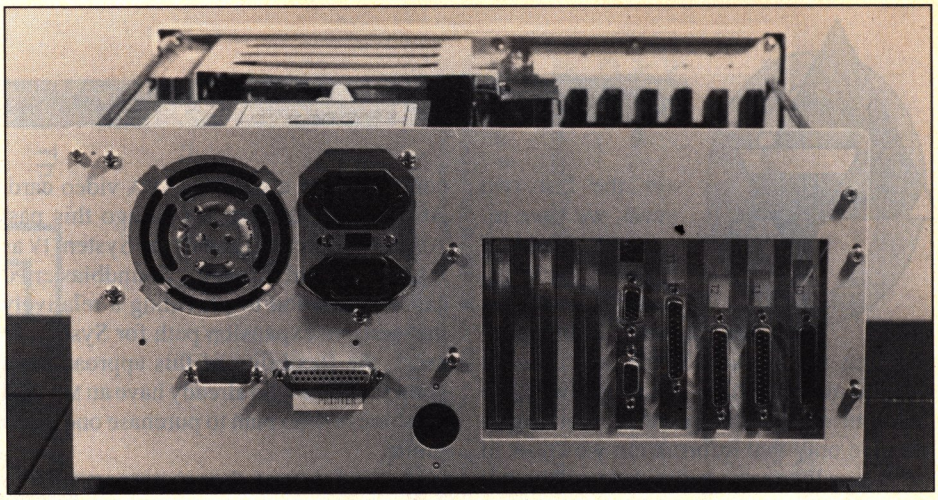


**Photo 2: System IV I/O Port Layout**

Because the serial ports are designed for direct connection to terminals, connection to DCE (Data Communications Equipment) devices, such as a modem, require the use of a null-modem adapter. Alternatively the pins in either the DB-25 connector or the IDC connector on the motherboard can be rearranged.

The floppy controller (a WD37C65 chip) on the motherboard is designed for two single-, double- or high-density drives. Also, there is a socket on the motherboard for a WD1772 controller chip to maintain compatibility with Peripheral Technology's earlier PT68K2 motherboard. The WD1772 supports up to four single- or double-density floppy drives, and the inclusion of this socket can be very beneficial if you want to add three or more floppy drives to the system. While Western Digital has discontinued the WD1772 floppy controller, it is still being manufactured by VLSI.

The XT-compatible keyboard interface is in keeping with the inexpensive expansion approach. Any XT-compatible keyboard can be used with the System IV, and these keyboards are available at low prices from most computer retail outlets.

### All Aboard ▲ ▲ ▲

For our evaluation of the System IV, we connected a Wyse 50 terminal, a 1200-bps modem, a CoCo 3 and a PC-compatible to the four serial ports. Hooking up the Wyse 50 was a simple matter of running a serial cable between the System IV and the terminal and setting the correct speed on both ends. Within a matter of minutes the Wyse 50 was up and running at 19,200 bps.

Connecting the modem involved rewiring the second serial port because the ports come wired for DCE. We could have used a simple null-modem adapter, but decided to make the change more permanent. (Besides, we are always running out of null-modem adapters.) Rewiring the connector was a lot easier than we had at first anticipated.

We expected connecting the PC-compatible would involve only running a cable and firing up *Procomm Plus* on the PC. The hardware hookup went fine, but *Procomm Plus*' implementation of VT-100 emulation leaves something to be desired. The standard VT-100 terminal sends three codes for the function and arrow keys, but `umacs` (the full-screen editor supplied with OS-9/68000) accepts only two-character key sequences. We could have remapped *Procomm Plus*' keyboard, but then we would have to manually remap the keyboard each time we called Delphi. This was too much hassle so we switched to *Crosstalk Communicator* on the PC. This allowed us to remap the keyboard while retaining the original VT-100 mapping — the keyboard layout is automatically selected in the dialing directory.

Connecting the CoCo 3 to the System IV presented a few unusual problems. We couldn't use the serial port on the rear of the CoCo because of its speed limitations. We used an RS-232 Pak and Multi-Pak Interface instead. The 6551 ACIA chip in the RS-232 Pak requires DSR and a few other signals be asserted (High) or the 6551 ignores the incoming data. To solve this, we rewired the serial port on the System IV and used a null-modem adapter from Radio Shack that asserts those signals (Cat. #26-1373).

We initially experimented with *JTerm* and *KBCom* under OS-9 Level II on the CoCo 3. However, we could not get reliable operation when communicating above 2400 bps. Take our word for it, you don't want to use a word processor at 2400 bps unless you have a lot of spare time. You need to be operating at 9600 bps or better to get reasonable response from the setup. We then switched to *VTerm* under Disk BASIC. *VTerm* works reliably at up to 19,200 through the RS-232 Pak and provides exceptional VT-100 emulation.

Using the CoCo 3 as a terminal to the System IV is an excellent way to enter the 68000 world. With this setup, you can run 68000-based software on the System IV and still have your CoCo available for running the software you already own. You won't gain the power of the 68000 for your CoCo software, but you can aquire 68000 software much as many of us have built our CoCo systems — a bit at a time. Ideally, someone will devise a way to get reliable operation of the CoCo 3 as an OS-9 terminal at 9600 or 19,200 bps. Level II's windows would then give you access to the System IV, OS-9 Level II and Disk BASIC (via Burke & Burke's RSB), all with just a press of the CoCo 3's CLEAR key.

It is important to note the problems we encountered connecting the PC-compatible and the CoCo 3 are not problems with the System IV. Rather, they are inherent to the way OS-9/68000 handles terminals and requirements of the 6551 ACIA in the RS-232 Pak. We explain our experiences here only to help you should you decide the System IV is right for you.

**Software** ▲ ▲ ▲

Software availability is an important consideration any time you are thinking about buying a computer. We contacted Microware and received *Microware Basic* (see the review on Page 54 of this issue) and *SMART*, an integrated business package featuring a word processor, a spreadsheet and a database. *Microware Basic* was way out of line with a price tag of $500, but *SMART* was a little more reasonable at $895. Yes, we know both these figures sound high. However, these products were developed for the professional/industrial markets where prices tend to run a little higher. As demand from the personal market increases, we could see the prices drop.

All portions of *SMART* ran well on the System IV console. We also had few problems running it from the PC and the CoCo 3 (acting as terminals). Using VT-100 emulation cleared up these problems rather quickly, which is why we mentioned VT-100 so heavily earlier. It is really beautiful to see such a program running in three places, from one computer, all at the same time. While we could run *SMART* from the Wyse 50, the display was not correct because of limitations in the Wyse 50 itself. Any other problems we had using *SMART* were products of the program and not the System IV. We were able to print hard copies of spreadsheets and typed documents using special features of the LaserJet printer.

We also received the OS-9/68000 version of the *DynaStar* and *DynaForm* text-editing package from Frank Hogg Laboratories ($99.95). Since *DynaStar* was designed for use with different terminals, we encountered no problems running it on the System IV, from the Wyse 50, the PC and the CoCo 3. We very recently received several of Frank Hogg's other software products (mostly utilities) and haven't yet gotten them transferred to the System IV. As soon as we do, we'll pass the word along to you.

Windsor Systems, which is located down the street from our offices, sent us *Quick Ed*. This text editor and formatter also runs on the System IV with no problems.

We are planning separate reviews of these products, and any others we receive. In addition, we are working on an in-depth preview of Professional OS-9/68000, drawing comparisons with OS-9 Levels I and II where applicable.

A good source for OS-9/68000-based programs is *The OS-9 Source Book* from Microware. Listed on its pages are software packages ranging from business applications to system utilities. As the new 68000 portion of this market warrants, we'll publish reviews of the products available.

Another possible source of software is already in place. While OS-9/68000 doesn't support some of the fancier graphics available through OS-9 Level II on the CoCo 3, there is no reason much of the C software available for the CoCo cannot be ported to OS-9/68000. And Delmar Company is working on a C graphics library for the System IV.

Delmar Company offers an optional OS-9/6809 emulator program. This emulator will run most OS-9/6809 software that is not hardcoded to use CoCo cursor control codes or graphics. Because it emulates the 6809, operation is really slow. However, it may fit a need for some users.

In short, while there is not an abundance of applications available for the 68000, the basic tools are there. What will happen in this personal-computing market remains to be seen.

**Support** ▲ ▲ ▲

The System IV is sturdily built and runs well, and Delmar Company stands behind its product. On several occasions we called Ed Gresick with questions about the System IV and about OS-9/68000. He was more than responsive in attending our requests, even if it meant calling us back. When we reported some bugs in the driver software, he immediately addressed the problem and sent us new drivers. For special setups, a call to Delmar Company was all it took to solve the problem. While the CoCo Community is a new market for Delmar Company, Delmar is not new to the computer industry. It started selling 68xx-based controllers in 1975 and has been going strong ever since.

Similarly, the PT68K4 motherboard is well-supported. We ran into a problem with the motherboard and shipped it directly to Peripheral Technology. The people there quickly traced the problem to a malfunctioning clock-generator chip, which Peripheral Technology quickly repaired.

The impression we get is that these two companies are serious and conscientious about their business. They understand that problems sometimes occur, and they work quickly to rectify them without a lot of runaround.

**In the Future** ▲ ▲ ▲

As mentioned earlier, a new driver supporting the second parallel port is in development, as are drivers for standard PC-compatible serial I/O cards and the QIC-40 tape drive. A C graphics library, supporting the System IV, is also on the way. Other products currently being developed include the ALT86 (a PC on a card that lets you run MS-DOS software), a SCSI interface with four additional serial ports, and an IDE interface with sockets for up to six megabytes of additional memory.

We have seen a prototype of the ALT86. This two-card set fits right in the slots on the System IV motherboard and features a V30 (8086-compatible) microprocessor running at 10 MHz, one megabyte of memory and a socket for an 8087 math coprocessor. The second board includes two serial ports, one parallel port, a real-time clock, a mouse port and a high-density floppy controller. This is not an emulator — you don't run MS-DOS software from OS-9/68000. However, it does add seriously to your options about the different software you can run with the System IV. At the RAINBOWfest, attendees were treated to *King's Quest V*, complete with VGA graphics and sound produced by a Sound Blaster card.

**The Bottom Line** ▲ ▲ ▲

Again, the System IV is not a CoCo. Rather it is a natural extension, for some, of the power of the 6809 in the CoCo. It is intended as a multiuser system, yet works extremely well for single users needing a lot of power. The System IV is reliable and is the product of two companies that offer a high level of service to their customers. Several expansion opportunities either exist or are near completion. In a nutshell, the System IV offers a lot at a relatively low cost.

Delmar Company
P.O. Box 78
Middletown, DE 19709
(302) 378-2555
Fax (302) 378-2556

*A multiple-choice test grader with strings attached*

# Let CoCo Do the Grading

**by Warren Cheves**

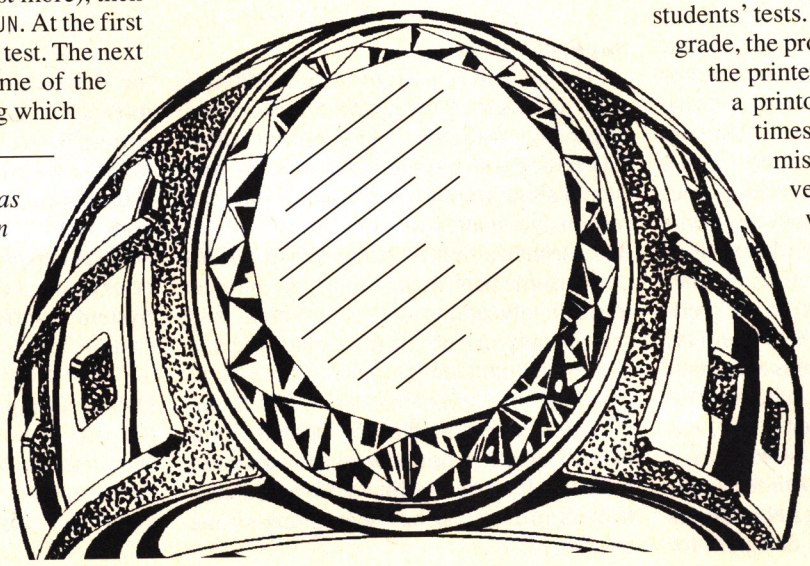
*Test Grader* makes short work of grading multiple-choice tests. To grade tests using *Test Grader*, you must enter the correct answers as well as the student's answers. The computer then compares the two sets of answers to determine the student's grade. You need only enter the correct answers once, but you must enter each student's answers separately. It is in this latter process where character strings are most useful. Instead of having to type in a multiple-choice answer, press ENTER, and repeat the process several times, the use of strings allows you to enter the student's answers as one long string and requires you to press ENTER only after entering the complete string. The time and aggravation of having to repeatedly press ENTER is reduced significantly.

Use the CLEAR command to clear plenty of string space (I find 500 bytes is ample for my needs, but you can request more), then load the program and enter RUN. At the first prompt, enter the name of the test. The next two prompts ask for the name of the course and the semester during which the test is given. Next, you must enter the number of questions on the test. After you enter the number of questions on the test, you must enter the correct answers to those questions. You can enter the correct answers in sequential order as one long string with no spaces. For example, if there are five questions on the test and the answer to the first question is A, the answer to the second question is B, etc., you would enter the correct-answer *string* as ABCDE. *Test Grader* checks to make sure the length of the string matches the number of questions on the test.

The next series of prompts pertain to the student's answers. Enter the answers in a string similar to the correct answer string in the example above. Remember to make sure the order of the questions in the two strings is the same. For example, if the student's answers to the five test questions are A, B, C, D, D, you would enter the student-answer string as ABCDD. Again, the computer checks the length of the string to make certain that five answers are entered. All of the answers in the correct-answer string must have a corresponding entry in the student's answer string. If not, you must reenter the student's answers.

The program then compares the answers in the two strings to calculate the student's grade on the test. For example, in our 'test' the correct-answer string is ABCDE and the student-answer string is ABCDD. The result is that the student gave one incorrect response to a test question. The program then generates a printout of the test results. From our example, the printout would show one question missed resulting in a score of 80 percent. The printout also lists the correct response for any questions that were answered incorrectly.

At this point, a prompt asks if you want to grade more tests. You can follow the same procedure to grade the remaining students' tests. If you have no more tests to grade, the program prompts you to ready the printer. Press any key to generate a printout that lists the number of times a particular question was missed. Such feedback can be very useful to teachers who want to determine areas in which the class is having difficulty. Since this information is accumulated over the number of tests graded, it is advantageous to grade as many tests as possible in one session. The largest number of tests I have graded in one session is 50, for which I used a CLEAR 500 command



*Warren Cheves is employed as a network administration supervisor for the United Telephone System. He is also a part-time economics teacher at East Tennessee State University. You may contact him by writing to 163 East Central Avenue, Bristol, TN 37620 or by calling (615) 968-8844. Please include an SASE when requesting a reply.*

# 2nd Annual Atlanta CoCofest

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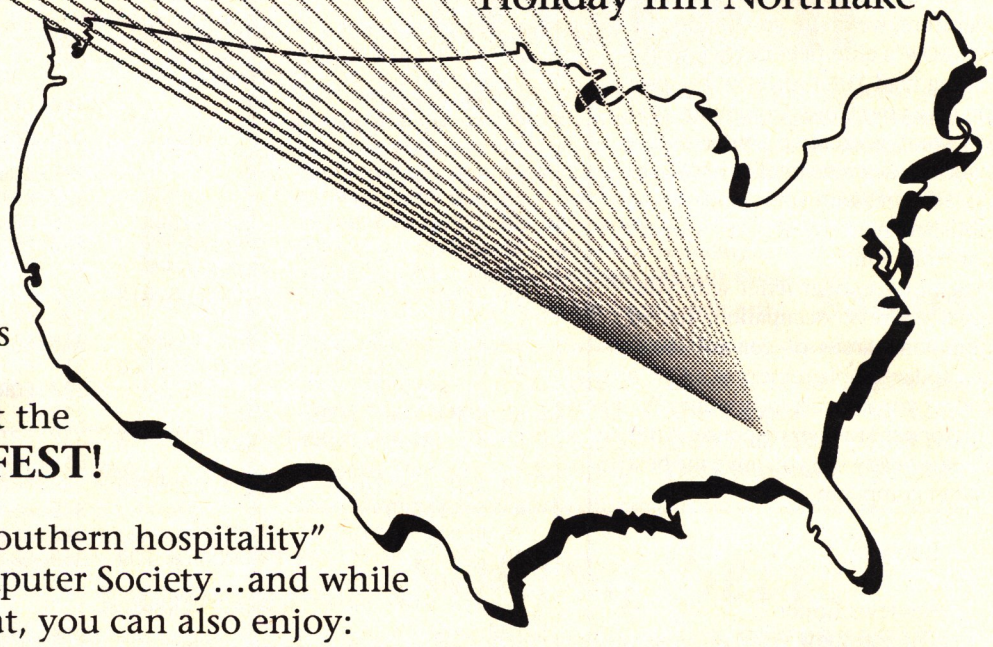

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- ***Demonstrations of the much-discussed, new "CoCo-4's"!***

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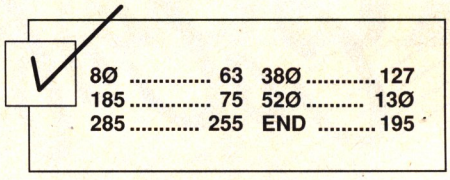
before loading the program. Using this command allows ample string space to grade tests.

The use of strings makes *Test Grader* very user-friendly and eliminates unnecessary keystrokes. This program should be of interest to all educators who grade multiple-choice tests. From a programming approach, one possible spin-off of *Test Grader* would be a program to collate data for a survey. ❑

16K Extended




**The Listing:** MCTEST

```
1 'LET YOUR COCO DO THE GRADING
2 'BY WARREN CHEVES
3 'COPYRIGHT (C) SEPTEMBER 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
15 REM A$ = TEST NAME OR NUMBER
20 REM B$ = COURSE NAME
25 REM C$ = SEMESTER
30 REM N = NUMBER OF QUESTIONS
35 REM D$ = CORRECT ANSWERS
40 REM E$ = STUDENT ANSWERS
45 REM F$ = CORRECT ANSWER STRIN
G
50 REM I = QUESTION NUMBER
55 REM C = COUNTER TO COUNT INCO
RRECT ANSWERS
60 REM G$ = STUDENT NAME
65 REM H$ = STUDENT ANSWER STRIN
G
70 REM J = TOTAL TIMES A QUESTIO
N IS MISSED
75 REM K = STUDENT GRADE
80 REM L$ = YES OR NO ANSWER FOR
 ANOTHER STUDENT
85 REM M$ = PRINTER READY INPUT
100 CLS
105 PRINT "ENTER TEST NAME"
110 INPUT A$
115 CLS
120 PRINT "ENTER COURSE NAME"
125 INPUT B$
130 CLS
135 PRINT "ENTER SEMESTER"
140 INPUT C$
145 CLS
150 PRINT "HOW MANY QUESTIONS?"
155 INPUT N
160 DIM D$(N)
165 DIM E$(N)
170 DIM J(N)
175 CLS
180 PRINT "ENTER CORRECT ANSWER
STRING"
185 INPUT F$
190 IF LEN(F$)<>N THEN 175
195 FOR I=1 TO N
200 D$(I) = LEFT$(F$,1)
205 F$ = RIGHT$(F$,N-I)
210 NEXT I
215 CLS
220 C=0
225 PRINT "ENTER STUDENT NAME"
230 INPUT G$
235 CLS
240 PRINT "ENTER STUDENT ANSWER
STRING"
245 INPUT H$
250 IF LEN(H$)<>N THEN 235
255 FOR I=1 TO N
260 E$(I) = LEFT$(H$,1)
265 H$ = RIGHT$(H$,N-I)
270 NEXT I
275 CLS
280 PRINT #-2,G$
285 PRINT #-2
290 PRINT #-2,B$
295 PRINT #-2
300 PRINT #-2,A$
305 PRINT #-2
310 PRINT #-2,C$
315 PRINT #-2
320 FOR I=1 TO N
325 IF E$(I)=D$(I) THEN 345
330 PRINT #-2,"QUESTION "I" IS "
D$(I)" INSTEAD OF "E$(I)
335 C=C+1
340 J(I)=J(I)+1
345 NEXT I
350 PRINT #-2
355 PRINT #-2, "QUESTIONS MISSED
: "C
360 PRINT #-2
365 K=((N-C)/N)*100
370 PRINT #-2, "GRADE: "K
375 PRINT G$
380 PRINT B$
385 PRINT A$
390 PRINT C$
395 PRINT
400 PRINT "QUESTIONS MISSED: "C
405 PRINT "GRADE: "K
410 PRINT
415 PRINT
420 PRINT "ANOTHER STUDENT(Y/N)?
"
425 INPUT L$
430 IF L$="Y" THEN 215
440 CLS
450 PRINT "GET PRINTER READY"
460 PRINT "HIT ANY KEY WHEN READ
Y"
470 M$=INKEY$
480 IF M$="" THEN 470
490 PRINT #-2,A$
500 PRINT #-2,B$
510 PRINT #-2,C$
520 PRINT #-2
530 FOR I=1 TO N
540 PRINT #-2, "QUESTION "I" WAS
 MISSED "J(I)" TIMES"
550 NEXT I
560 END
```

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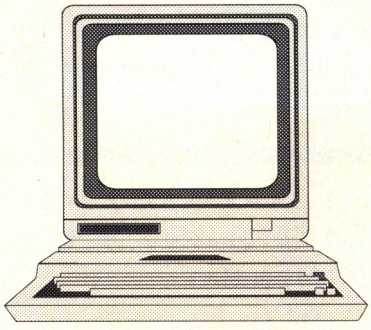

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# The Assembly Line

# A Fine Fern

## by William P. Nee

Several months ago I discussed warping and moving objects onscreen. Now let's take those ideas one step further by creating several new objects from an original and redrawing them on a random basis, producing amazing results.

Our objects will be redrawn using a process called *affine transformations*. In this method, the new coordinates of a point based on the old $x$ and $y$ values are

$$x_{new} = Ax+By+E$$
$$y_{new} = Cx+Dy+F$$

The coefficients A through F are determined by plotting any three points on the original object (A$x$, A$y$), (B$x$, B$y$), (C$x$, C$y$) and then plotting the corresponding points (a$x$,a$y$), (b$x$, b$y$), (c$x$, c$y$) on the new object. We must solve the following equations:

```
A*Ax+B*Ay+E = ax
C*Ax+D*Ay+F = ay
A*Bx+B*By+E = bx
C*Bx+D*By+F = by
A*Cx+B*Cy+E = cx
C*Cx+D*Cy+F = cy
```

*Bill Nee reversed the snowbird trend by retiring to Wisconsin from a banking career in Florida. The success of his 13-part series, "Machine Language Made BASIC" (July 1988 to July 1989), prompted him to continue writing articles about Color Computer machine-language programming. You may contact Bill at Route 2, Box 216C, Mason, WI 54856-9302, (715) 766-2952. Please include an SASE when requesting a reply*

Don't despair! Listing 1 does all of this math for you. All you have to do is plug in the original and transform coordinates as DATA statements; the program generates coefficients A through F.

Now let's try an example. Plot a triangle with corners at (0,0), (2,0) and (1,1). Connect the midpoint of the three sides to form four smaller triangles. Right now we'll use just the top triangle as our new object, so the corresponding points are as follows:

A = (0,0) B = (2,0) C = (1,1)
a = (.5,.5) b = (1.5,.5) c = (1,1)

After you've entered Listing 1, save it as AFFCOMP and run it. The first DATA statement (Line 190) tells the program how many new objects there are (one in this example) and the coordinates of the three original points. The next DATA statement (Line 200) gives the corresponding coordinates on the new object. The coefficients are:

A = .5 B = 0 C = 0
D = .5 E = .5 F = .5

So

$$x_{new} = x/2 + .5$$
$$y_{new} = y/2 + .5$$

But we can plot more than one new object. So let's take the triangle we divided and compute the coefficients for the lower-left and lower-right triangles, ignoring the center one. Since there are now three new objects, change the first DATA line to start with 3 and add two new DATA lines (210 and 220) with the coordinates of the two new triangles. Run the program and you should get the coefficients as shown in Figure 1.

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **Triangle 1** | .5 | 0 | 0 | .5 | .5 | .5 |
| **Triangle 2** | .5 | 0 | 0 | .5 | 0 | 0 |
| **Triangle 3** | .5 | 0 | 0 | .5 | 1 | 0 |

**Figure 1: Example Coefficients**

### A Random Look

Let's plot new coordinates using these three equations, but on a random basis. Each computed point becomes the old coordinates for the next new point. Even on a random basis, the new objects stay separate and form an outline of the original. Listing 2 (AFFINE1) demonstrates this by using a different color for each triangle. Enter and run this program. The three triangles remain separate, but gradually fill the screen with triangles containing a triangular hole. This figure, a fractal, is a Sierpinski Triangle. Notice in Line 110 that 10 new coordinates are computed before any are plotted. This ensures the coordinates have "settled down" into a new object. I also scaled each point in Line 50 so the entire screen is filled — the original object is only two units long and one unit high.

The more completely the new objects make up the entire object, the more accurately the random plotting represents the entire object. We could compute the coefficients for that center triangle and plot all

four equations on a random basis to produce a solid triangle.

Another item needs to be considered when plotting each point — its probability. The area of any new object is roughly

```
ABS(A*D-B*C)
```

Therefore, the total area is the sum of all the individual areas. For the triangle with three new objects, the total area is .25+.25+.25, or .75. The probability of each triangle is the area of that individual triangle divided by the total area. In this case, the probability for each triangle is .25/.75, or $^1/_3$. However, other examples won't work out so evenly.

Any time the probability for one object is zero, give it a low value, such as .01, instead. Since you'll be using random numbers to determine which object to plot, have each object's probability be the sum of all the probabilities up to that one. Then you can use `RND(0)` to see which objects are plotted. The probability of the last object must be 1, as shown in Figure 2.

| Object | AD - BC | Use | Probability | Use |
|---|---|---|---|---|
| 1 | 0 | .01 | .010563 | .010563 |
| 2 | +.1038 | .1038 | .109644 | .120207(.010563+.109644) |
| 3 | -.1088 | .1088 | .1149255 | .2351325 (.120207+.1149255) |
| 4 | .7241 | .7241 | .7648675 | 1.0 |
| Total | | .9467 | | |

If `RND(0)` <= .010563, compute Object 1.
If `RND(0)` <= .120207, compute Object 2.
If `RND(0)` <= .2351325, compute Object 3.
Else compute Object 4.

**Figure 2: Object Probability**

The final step is to compute the scaling factors so the picture fills the screen. In the triangle example we drew it two units across, so the *x*-scale factor is the screen width (128) divided by 2, or 64. The *y*-scale factor is 191 divided by 1, or 191. But what if you don't know the original size? You could keep retrying different scale factors and offsets, but that gets pretty tedious. Instead, I run the program initially without setting any points. Four variables — `XMIN`, `XMAX`, `YMIN` and `YMAX` — are initially set to zero. As the program runs, these variables get closer to the actual limits of the initial object. When you stop after, say 2500 iterations, compute the values as follows:

$x_{scale}$ = horizontal screen/(XMAX-XMIN)
$y_{scale}$ = vertical screen/(YMAX-YMIN)

$x_{offset}$ = -XMIN*$x_{scale}$
$y_{offset}$ = -YMIN*$y_{scale}$

## Speeding the Process

This is a lot of work for a BASIC program to perform. Let's compute the scale, and compute and `PSET` the coordinates with a machine-language program (Listing 4). The program starts with four macros: One to do a `PMODE4 PSET`, one to `PRINT@` a variable, one to `PRINT@` the contents of Register D, and one to `PRINT@` a message. As usual, macros can be used with any program. Lines 910 through 990 print nine messages using a macro.

After setting the counter to zero, lines 1060 through 1240 decide which object to use by comparing `RND(0)` to the object probabilities. Then new coordinates are computed (lines 1310-1840). These coordinates are compared to the current minimum and maximum values and replaced if necessary (lines 1860-2170).

Since the minimums and maximums may not have reached their full values, I have the program multiply each value by a factor of 1.1 and compute the scales and offsets (lines 2250-2980). These values are printed on the screen so you can copy them. Then the program stops and waits for you to press any key before drawing.

Part 2 (Line 3250) is very similar to the beginning part of the program. `RND(0)` is compared to the object probabilities and new coordinates are computed, but now the offsets are added (lines 3540-4170). These coordinates are then checked to see if they will plot on the screen (lines 4190-4350). If so, they are `PSET`. If you don't press any key, the program loops back to `AGAIN` and keeps repeating. After debugging, save the source code with `W AFFINE.ASM` and assemble it with `A AFFINE.BIN /NS/WE`.

The `PMODE4 BASIC` program for this article (Listing 3) loads the machine-language program if necessary. After declaring all variables, the program clears both screens and draws a cursor (Line 70). The menu options in Line 90 let you include the boundaries of the original object in your `DATA` line or have the program compute the boundaries for you. If you choose Option 1, the program begins drawing after completing some calculations. If you choose Option 2, the program displays the computed minimums and maximums with the iteration count. Pressing any key computes the scaling factors and offsets.

Line 120 reads the coefficients and computes each object's area using .05 as the minimum area. Lines 140 through 150 compute the probability for each object. The subroutine in Line 600 pokes all the coefficients, probabilities and colors into their locations in the machine-language program. Line 170 executes the machine-language program if you chose Option 2. If you chose Option 1, lines 180 through 280 compute the scales and offsets and poke these, along with the minimums and maximums, into their proper locations before executing the machine-language program.

You may press any key to stop drawing at any time. You are taken to Menu 2 in Line 310 to "zoom in" on part of the picture or resume drawing the original. If you choose Option 1, lines 350 through 410 poke the original data back into location, transfer the picture from pages 5 through 8 to pages 1 through 4 and continue drawing. Selecting Option 2 first calls a cursor routine (lines 1100-1290). Move the cursor to the beginning point in the upper-left corner of the screen using the joystick. Hold down the firebutton and move the cursor to the ending point in the lower-right corner of the screen. A box connects these points. When you release the firebutton, the program computes the new minimums and maximums. Since the screen variable `NN` is set to 700 in Line 60, you can only zoom an area slightly more than half the size of the screen. You will usually want to examine a much smaller area than this.

The rest of the `ZOOM` routine computes the scales and offsets and prints them to the screen. Press any key and the program starts drawing. After entering this program, save it as `AFFINE2`. Run it and select Option 2. After a while, press any key to see the current minimums and maximums for the triangle. Again, press any key to begin drawing it. Try zooming on one of the three smaller triangles. Stop the program, insert `REM` statements in lines 450 through 470 and remove them from lines 490 through 530. Run the program again. This time, since the minimum and maximum are `DATA` lines, choose Option 1. You'll begin to see a fern-like object appear. Where did it come from? It all started with a single leaf inside a 12-by-10 rectangle. The tip (A) is at coordinates

(12,10), a midpoint on the right (B) is at (11,3), and the base of the stem (C) is at (6,0).

Now draw four similar leaves inside the big leaf. I made the first leaf right at the stem, the second leaf curved around the left side, the third leaf curved around the right side, and the fourth leaf covered the top two-thirds. The coordinates I used in AFFCOMP to determine the coefficients are shown in Figure 3.

| | A | B | C |
|---|---|---|---|
| **Original** | (12,10) | (11,3) | (6,0) |
| **Leaf 1** | (6,1.5) | (6,.5) | (6,0) |
| **Leaf 2** | (2,4.5) | (5,3) | (6,1.5) |
| **Leaf 3** | (11,3.5) | (7,2) | (6,.5) |
| **Leaf 4** | (12,0) | (10.5,4) | (6,1.5) |

DATA lines 490-520 are the computed coefficients.

**Figure 3:** AFFCOMP **Coordinates**

The same procedure was used to produce the "tree" equations in DATA lines 550 through 580. Any of the coefficients can be changed to produce interesting results. If you make very large changes though, you'll probably have to choose Option 2 and rescale the results. For some interesting variations, try changing the .5 in Line 580 to 1.5, or change the .84 and .86 in Line 520 to negative numbers. Above all, keep experimenting with the program — I'm sure you'll do "affine" job.

Next time we'll look at some of the rules of *Life*. And if you have any questions about machine-language programming or suggestions for future articles, don't hesitate to let me know. ❑

64K Disk

**Listing 1:** AFFCOMP

```
1 'THE ASSEMBLY LINE
2 'BY WILLAM P. NEE
3 'COPYRIGHT (C) SEPTEMBER 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 CLS:P$="##.## "
20 READ M,A1,A2,B1,B2,C1,C2
21 DE=(A1-B1)*(B2-C2)-(B1-C1)*(A
2-B2)
30 FOR N=1 TO M
40 READ AA(1),AA(2),BB(1),BB(2),
CC(1),CC(2)
50 A=((AA(1)-BB(1))*(B2-C2)-(BB(
1)-CC(1))*(A2-B2))/DE
60 B=((BB(1)-CC(1))*(A1-B1)-(AA(
1)-BB(1))*(B1-C1))/DE
70 E=AA(1)-A1*A-A2*B
80 C=((AA(2)-BB(2))*(B2-C2)-(BB(
2)-CC(2))*(A2-B2))/DE
90 D=((BB(2)-CC(2))*(A1-B1)-(AA(
2)-BB(2))*(B1-C1))/DE
100 F=AA(2)-A1*C-A2*D
110 PRINT@7*N-2,N;
120 PRINT@32,"A=";:PRINT@32+7*N-
3,USING P$;A
130 PRINT@64,"B=";:PRINT@64+7*N-
3,USING P$;B
140 PRINT@96,"C=";:PRINT@96+7*N-
3,USING P$;C
150 PRINT@128,"D=";:PRINT@128+7*
N-3,USING P$;D
160 PRINT@160,"E=";:PRINT@160+7*
N-3,USING P$;E
170 PRINT@192,"F=";:PRINT@192+7*
N-3,USING P$;F
180 NEXT
190 DATA 1,0,0,2,0,1,1
200 DATA .5,.5,1.5,.5,1,1
210 'DATA 0,0,1,0,.5,.5
220 'DATA 1,0,2,0,1.5,.5
```

**Listing 2:** AFFINE1

```
1 'THE ASSEMBLY LINE
2 'BY WILLIAM P. NEE
3 'COPYRIGHT (C) SEPTEMBER 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 'AFFINE TRIANGLE DEMO
20 Z=RND(-TIMER):CLS
30 FOR X=1 TO 3
40 READ A(X),B(X),C(X),D(X),E(X)
,F(X),CC(X):NEXT
50 XS=64:YS=190
60 PMODE3,1:PCLS:SCREEN1,1
70 CC=CC+1:N=RND(3)
80 XX=A(N)*X+B(N)*Y+E(N)
90 YY=C(N)*X+D(N)*Y+F(N)
100 X=XX:Y=YY
110 IF CC<10 THEN 70
120 XP=X*XS:XP=XP+XP
130 YP=INT(191-Y*YS)
140 PSET(XP,YP,CC(N)):GOTO70
150 DATA .5,0,0,.5,0,0,2
160 DATA .5,0,0,.5,1,0,3
170 DATA .5,0,0,.5,.5,.5,4
```

**Listing 3:** AFFINE2

```
1 'THE ASSEMBLY LINE
2 'BY WILLIAM P. NEE
3 'COPYRIGHT (C) SEPTEMBER 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 PCLEAR8
20 CLEAR 200,&H6000-1
30 IF PEEK(&H60D2)<>204 THEN LOA
DM"AFFINE":POKE &HFF40,0
40 Z=RND(-TIMER):CLS
50 READ M:M=M-1:DIM A(3),B(3),C(
3),D(3),E(3),F(3),P(3),CC(3),XS,
YS,NX,MX,NY,MY,XO,YO,S1,SC
60 DIM CU(1),GG(1),NN(700):FB=&H
FF00
70 PMODE4,1:PCLS:DRAW"C1;BM0,0;N
R5;ND5;F7":GET(0,0)-(7,7),CU
80 PMODE4,5:PCLS:S1=0
90 PRINT:PRINT"AFFINE TRANSFORMA
TIONS","1> READ SCALE",,"2> COMP
UTE SCALE"
100 A$=INKEY$:IF A$="" THEN 100
ELSE IF A$="1" THEN S1=1
110 CLS:PRINT@200,"COMPUTING!":F
OR X=0 TO M
120 READ A(X),B(X),C(X),D(X),E(X
),F(X),CC(X):S=ABS(A(X)*D(X)-B(X
)*C(X)):IF S<.05 THEN S=.05
130 SU=SU+S:TP(X)=S:NEXT
140 FOR X=0 TO M:P=P+TP(X)/SU
150 P(X)=P:NEXT:GOSUB 600
160 FOR N=0 TO M:POKE &H6005+N,0
:POKE &H6016+N,0:POKE &H602E+N,0
:POKE &H6033+N,0:POKE &H6038+N,0
```


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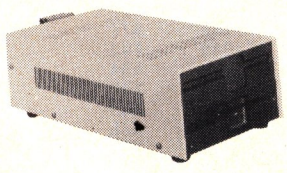

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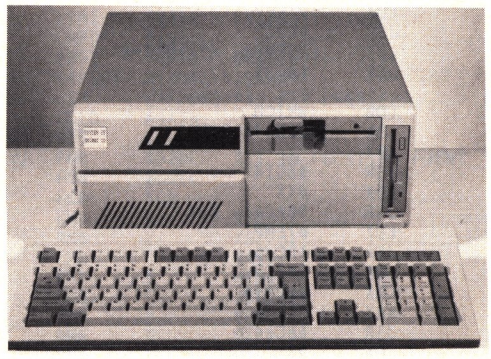
```
:POKE &H603D+N,0:NEXT
170 IF S1=0 THEN EXEC &H60D2:GOT
O 400
180 READ NX,MX,NY,MY
190 XS=255/(MX-NX):XO=INT(-XS*NX
+.5):IF XO<0 THEN XO=&HFFFF+XO+1
200 YS=191/(MY-NY):YO=INT(-YS*NY
+.5):IF YO<0 THEN YO=&HFFFF+YO+1
210 V=VARPTR(NX):FOR N=0 TO 4:PO
KE &H65F7+N,PEEK(V+N):NEXT
220 V=VARPTR(MX):FOR N=0 TO 4:PO
KE &H65F2+N,PEEK(V+N):NEXT
230 V=VARPTR(NY):FOR N=0 TO 4:PO
KE &H6608+N,PEEK(V+N):NEXT
240 V=VARPTR(MY):FOR N=0 TO 4:PO
KE &H6603+N,PEEK(V+N):NEXT
250 V=VARPTR(XS):FOR N=0 TO 4:PO
KE &H65EB+N,PEEK(V+N):NEXT
260 V=VARPTR(YS):FOR N=0 TO 4:PO
KE &H65FC+N,PEEK(V+N):NEXT
270 MSB=INT(XO/256):LSB=XO-MSB*2
56:POKE &H65F0,MSB:POKE &H65F1,L
SB
280 MSB=INT(YO/256):LSB=YO-MSB*2
56:POKE &H6601,MSB:POKE &H6602,L
SB
290 IF S1=0 THEN EXEC &H60D2
300 GOTO 350
310 CLS:PRINT@12,"M E N U":PRINT
" 1> FULL PICTURE"," 2> ZOOM IN"
320 A$=INKEY$:IF A$="" THEN 320
330 ON VAL(A$) GOTO 350,900
340 GOTO 320
350 FOR N=0 TO 4:POKE &H6000+N,P
EEK(&H65EB+N):POKE &H602E+N,PEEK
(&H65F2+N):POKE &H6033+N,PEEK(&H
65F7+N):NEXT
360 FOR N=0 TO 1:POKE &H600F+N,P
EEK(&H65F0+N):NEXT
370 FOR N=0 TO 4:POKE &H6011+N,P
EEK(&H65FC+N):POKE &H6038+N,PEEK
(&H6603+N):POKE &H603D+N,PEEK(&H
6608+N):NEXT
380 FOR N=0 TO 1:POKE &H6020+N,P
EEK(&H6601+N):NEXT
390 SC=0
400 PMODE4,1:SCREEN1,1
410 PCOPY 5 TO 1:PCOPY 6 TO 2:PC
OPY 7 TO 3:PCOPY 8 TO 4
420 EXEC &H649A
430 PCOPY 1 TO 5:PCOPY 2 TO 6:PC
OPY 3 TO 7:PCOPY 4 TO 8:GOTO 310
440 'TRIANGLE
450 DATA 3,.5,0,0,.5,0,0,4
460 DATA .5,0,0,.5,1,0,4
470 DATA .5,0,0,.5,.5,.5,4
480 'FERN
490 'DATA 4,0,0,.2,.14,6,-.09,4
500 'DATA .22,-.53,.19,.19,4.69,
.38,4
510 'DATA -.16,.59,.19,.19,6.94,
-.63,4
520 'DATA .84,.09,-.02,.86,.94,1
.59,4
530 'DATA 0,12,0,10
540 'TREE
550 'DATA 4,.42,.42,-.42,.42,0,.
2,4
560 'DATA .42,-.42,.42,.42,0,.2,
4
570 'DATA .1,0,0,.1,0,.2,4
580 'DATA 0,0,0,.5,0,0,4
590 'DATA -.25,+.25,0,.45
600 DA=&H6042:FOR N=0 TO 3
610 V=VARPTR(A(N)):FOR X=0 TO 4:
POKE DA+X,PEEK(V+X):NEXT X
620 DA=DA+5:NEXT N
630 FOR N=0 TO 3
640 V=VARPTR(B(N)):FOR X=0 TO 4:
POKE DA+X,PEEK(V+X):NEXT
650 DA=DA+5:NEXT N
660 FOR N=0 TO 3
670 V=VARPTR(C(N)):FOR X=0 TO 4:
POKE DA+X,PEEK(V+X):NEXT X
680 DA=DA+5:NEXT N
690 FOR N=0 TO 3
700 V=VARPTR(D(N)):FOR X=0 TO 4:
POKE DA+X,PEEK(V+X):NEXT X
710 DA=DA+5:NEXT N
720 FOR N=0 TO 3
730 V=VARPTR(E(N)):FOR X=0 TO 4:
POKE DA+X,PEEK(V+X):NEXT X
740 DA=DA+5:NEXT N
750 FOR N=0 TO 3
760 V=VARPTR(F(N)):FOR X=0 TO 4:
POKE DA+X,PEEK(V+X):NEXT X
770 DA=DA+5:NEXT N
780 FOR N=0 TO 3
790 V=VARPTR(P(N)):FOR X=0 TO 4:
POKE DA+X,PEEK(V+X):NEXT X
800 DA=DA+5:NEXT N
810 FOR N=0 TO M
820 POKE &H60CE+N,(CC(N)-1)*85:N
EXT
830 RETURN
900 'ZOOM
910 PMODE4,1:SCREEN1,1:GOSUB 110
0
920 XS=255/(MX-NX):XO=-XS*NX
930 PRINTUSING"X SCALE=####  XOF
F=+####";XS;XO+.5
940 XS=INT(XS):XO=INT(XO+.5):IF
XO<0 THEN XO=&HFFFF+XO+1
950 V=VARPTR(XS):FOR N=0 TO 4
960 POKE &H6000+N,PEEK(V+N):NEXT
970 MSB=INT(XO/256):LSB=XO-MSB*2
56:POKE &H600F,MSB:POKE &H6010,L
SB
980 YS=191/(MY-NY):YO=-YS*NY
990 PRINTUSING"Y SCALE=####  YOF
F=+####";YS;YO+.5
1000 YS=INT(YS):YO=INT(YO+.5):IF
 YO<0 THEN YO=&HFFFF+YO+1
1010 V=VARPTR(YS):FOR N=0 TO 4
1020 POKE &H6011+N,PEEK(V+N):NEX
T
1030 MSB=INT(YO/256):LSB=YO-MSB*
256:POKE &H6020,MSB:POKE &H6021,
LSB
1040 PRINT:PRINT"  <PRESS ANY KE
Y TO CONTINUE>"
1050 EXEC &HADFB
1060 PMODE4,1:PCLS:SCREEN1,1
1070 EXEC &H649A:GOTO 310
1100 'CURSOR ROUTINE
1110 X=INT(JOYSTK(0)/2)*8:Y=JOYS
TK(1)*3
1120 GET(X,Y)-(X+7,Y+7),GG:PUT(X
,Y)-(X+7,Y+7),CU:PUT(X,Y)-(X+7,Y
+7),GG
1130 IF PEEK(FB)<>254 AND PEEK(F
B)<>126 THEN 1110
1140 XX=INT(JOYSTK(0)/2)*8+7:YY=
JOYSTK(1)*3
1150 IF XX-X<7 OR YY-Y<7 THEN 11
40
1160 GET(X,Y)-(XX,YY),NN:LINE(X,
Y)-(XX,YY),PSET,B:PUT(X,Y)-(XX,Y
Y),NN
1170 IF PEEK(FB)<>255 AND PEEK(F
B)<>127 THEN 1140
1180 IF SC=1 THEN 1240
1190 MX=0:V=VARPTR(MX):FOR N=0 T
O 4:POKE V+N,PEEK(&H602E+N):NEXT
1200 NX=0:V=VARPTR(NX):FOR N=0 T
O 4:POKE V+N,PEEK(&H6033+N):NEXT
1210 MY=0:V=VARPTR(MY):FOR N=0 T
O 4:POKE V+N,PEEK(&H6038+N):NEXT
1220 NY=0:V=VARPTR(NY):FOR N=0 T
O 4:POKE V+N,PEEK(&H603D+N):NEXT
1230 SC=1
1240 DX=MX-NX:DY=MY-NY
1250 MX=MX-DX*(255-XX)/256
1260 NX=NX+DX*X/256
1270 MY=MY-(DY)*(Y)/192
1280 NY=NY+DY*(191-YY)/192
1290 RETURN
```

**Listing 4:** AFFINE.ASM

```
00100 P4PSET  MACRO
00110         LDA     #191
00120         SUBA    \1
00130         LDB     #32
00140         MUL
00150         ADDA    $BA
00160         TFR     D,X
00170         LDB     \0
00180         LSRB
00190         LSRB
00200         LSRB
00210         ABX
00220         LDA     \0
00230         ANDA    #7
00240         LDU     #$92DD
00250         LDA     A,U
00260         ORA     ,X
00270         STA     ,X
00280         ENDM
00290
00300 VPRINT  MACRO
00310         LDD     #\0
00320         ADDD    #$400
00330         STD     $88
00340         LDX     #\1
00350         JSR     $BC14
00360         JSR     $BDD9
00370         LEAX    -1,X
00380         JSR     $B99C
00390         JSR     $B958
00400         ENDM
00410
00420 DPRINT  MACRO
00430         LDD     #\0
00440         ADDD    #$400
00450         STD     $88
00460         LDD     \1
00470         JSR     $BDCC
00480         JSR     $B958
00490         ENDM
```

```
00500
00510 MPRINT  MACRO
00520         LDD     #\0
00530         ADDD    #$400
00540         STD     $88
00550         LDX     #\1
00560         JSR     $B99C
00570         JSR     $B958
00580         ENDM
00590
00600         ORG     $6000
00610 XS      RMB     5
00620 XX      RMB     5
00630 TEMPX   RMB     5
00640 XOFF    RMB     2
00650 YS      RMB     5
00660 YY      RMB     5
00670 TEMPY   RMB     5
00680 YOFF    RMB     2
00690 TEMP    RMB     5
00700 ACROSS  RMB     2
00710 DOWN    RMB     2
00720 WHICH   RMB     1
00730 COUNT   RMB     2
00740 MAXX    RMB     5
00750 MINX    RMB     5
00760 MAXY    RMB     5
00770 MINY    RMB     5
00780
00790 ADATA   RMB     20
00800 BDATA   RMB     20
00810 CDATA   RMB     20
00820 DDATA   RMB     20
00830 EDATA   RMB     20
00840 FDATA   RMB     20
00850 P1      RMB     5
00860 P2      RMB     5
00870 P3      RMB     5
00880 P4      RMB     5
00890 COLOR   RMB     4
00900
00910 START   MPRINT  2*32,M1 PRINT MESSAGES 1-9
00920         MPRINT  3*32,M2
00930         MPRINT  4*32,M3
00940         MPRINT  5*32,M4
00950         MPRINT  6*32,M5
00960         MPRINT  7*32,M6
00970         MPRINT  8*32,M7
00980         MPRINT  9*32,M8
00990         MPRINT  10*32+4,M9
01000         LDD     #0      SET COUNTER TO 0
01010         STD     COUNT
01020 SCALE   CLR     $6      USING NUMBER VARIABLES
01030         CLRB
01040         JSR     $BC7C
01050         JSR     $BF1F   RANDOM(0)
01060 P1TEST  LDX     #P1
01070         JSR     $BC96   COMPARE RND(0) TO P1
01080         CMPB    #1      REG B=1 IF FP1 IS GREATER
01090         BEQ     P2TEST
01100         CLRB
01110         BRA     COLORS
01120 P2TEST  LDX     #P2
01130         JSR     $BC96
01140         CMPB    #1
01150         BEQ     P3TEST
01160         LDB     #1
01170         BRA     COLORS
01180 P3TEST  LDX     #P3
01190         JSR     $BC96
01200         CMPB    #1
01210         BEQ     P4TEST
01220         LDB     #2
01230         BRA     COLORS
01240 P4TEST  LDB     #3
01250 COLORS  LDX     #COLOR
01260         LDA     B,X
01270         STA     $B5
01280         LDA     #5      EACH DATA IS 5 BYTES LONG
01290         MUL
01300         STB     WHICH
01310         LDX     #ADATA
01320         ABX
01330         JSR     $BC14
01340         LDX     #XX
01350         JSR     $BACA   A*X
01360         LDX     #TEMP
01370         JSR     $BC35
01380
01390         LDB     WHICH
01400         LDX     #BDATA
01410         ABX
01420         JSR     $BC14
```


# SYSTEM IV



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```
01430          LDX     #YY
01440          JSR     $BACA    B*Y
01450          LDX     #TEMP
01460          JSR     $B9C2
01470          LDX     #TEMP    A*X+B*Y
01480          JSR     $BC35
01490
01500          LDB     WHICH
01510          LDX     #EDATA
01520          ABX
01530          JSR     $BC14
01540          LDX     #TEMP
01550          JSR     $B9C2
01560          LDX     #TEMPX   A*X+B*Y+E
01570          JSR     $BC35
01580
01590          LDB     WHICH
01600          LDX     #CDATA
01610          ABX
01620          JSR     $BC14
01630          LDX     #XX
01640          JSR     $BACA    C*X
01650          LDX     #TEMP
01660          JSR     $BC35
01670          LDB     WHICH
01680          LDX     #DDATA
01690          ABX
01700          JSR     $BC14
01710          LDX     #YY
01720          JSR     $BACA    D*Y
01730          LDX     #TEMP
01740          JSR     $B9C2
01750          LDX     #TEMP    C*X+D*Y
01760          JSR     $BC35
01770          LDB     WHICH
01780          LDX     #FDATA
01790          ABX
01800          JSR     $BC14
01810          LDX     #TEMP
01820          JSR     $B9C2
01830          LDX     #TEMPY   C*X+D*Y+F
01840          JSR     $BC35
01850
01860 TEST1    LDX     #TEMPX
01870          JSR     $BC14
01880          LDX     #XX
01890          JSR     $BC35
01900          LDX     #MAXX
01910          JSR     $BC96    COMPARE NEWX TO MAXX
01920          CMPB    #1
01930          BNE     TEST2    BRANCH IF LESS OR EQUAL
01940          JSR     $BC35    MAXX=NEWX
01950          VPRINT  3*32+5,MAXX      PRINT MAXX
01960          BRA     NEXT
01970 TEST2    LDX     #MINX
01980          JSR     $BC96
01990          BPL     NEXT
02000          JSR     $BC35
02010          VPRINT  2*32+5,MINX
02020 NEXT     LDX     #TEMPY
02030          JSR     $BC14
02040          LDX     #YY
02050          JSR     $BC35
02060          LDX     #MAXY
02070          JSR     $BC96
02080          CMPB    #1
02090          BNE     TEST4
02100          JSR     $BC35
02110          VPRINT  5*32+5,MAXY
02120          BRA     DONE
02130 TEST4    LDX     #MINY
02140          JSR     $BC96
02150          BPL     DONE
02160          JSR     $BC35
02170          VPRINT  4*32+5,MINY
02180 DONE     LDD     COUNT
02190          ADDD    #1       INCREASE COUNT
02200          STD     COUNT
02210          DPRINT  1*32+5,COUNT     PRINT COUNT
02220          JSR     [$A000] ANY KEY PRESSED?
02230          LBEQ    SCALE
02240
02250          CLR     $6       USING NUMBER VARIABLES
02260          LDX     #MINX
02270          JSR     $BC14
02280          LDX     #FACTOR
02290          JSR     $BACA
02300          LDX     #MINX
02310          JSR     $BC35    MINX*FACTOR
02320          LDX     #X4
02330          JSR     $BC35
02340          LDX     #MAXX
02350          JSR     $BC14
02360          LDX     #FACTOR
02370          JSR     $BACA
02380          LDX     #MAXX
02390          JSR     $BC35
02400          LDX     #X3
02410          JSR     $BC35
02420          LDX     #MINY
02430          JSR     $BC14
02440          LDX     #FACTOR
02450          JSR     $BACA
02460          LDX     #MINY
02470          JSR     $BC35
02480          LDX     #Y4
02490          JSR     $BC35
02500          LDX     #MAXY
02510          JSR     $BC14
02520          LDX     #FACTOR
02530          JSR     $BACA
02540          LDX     #MAXY
02550          JSR     $BC35
02560          LDX     #Y3
02570          JSR     $BC35
02580          LDD     #255
02590          JSR     $B4F4
02600          LDX     #TEMP
02610          JSR     $BC35
02620          LDX     #MINX
02630          JSR     $BC14
02640          LDX     #MAXX
02650          JSR     $B9B9    MAXX-MINX
02660          LDX     #TEMP
02670          JSR     $BB8F    255/(MAXX-MINX)
02680          LDX     #XS
02690          JSR     $BC35    SAVE AS XSCALE
02700          LDX     #X1      SAVE IT HERE,TOO
02710          JSR     $BC35
02720          LDX     #MINX
02730          JSR     $BACA    XSCALE*MINX
02740          COM     $54      NEGATE RESULT
02750          JSR     $B3ED
02760          STD     XOFF     SAVE AS XOFFSET
02770          STD     X2       SAVE IT HERE,TOO
02780
02790          LDD     #191
02800          JSR     $B4F4
02810          LDX     #TEMP
02820          JSR     $BC35
02830          LDX     #MINY
02840          JSR     $BC14
02850          LDX     #MAXY
02860          JSR     $B9B9
02870          LDX     #TEMP
02880          JSR     $BB8F
02890          LDX     #YS
02900          JSR     $BC35
02910          LDX     #Y1
02920          JSR     $BC35
02930          LDX     #MINY
02940          JSR     $BACA
02950          COM     $54
02960          JSR     $B3ED
02970          STD     YOFF
02980          STD     Y2
02990          VPRINT  6*32+7,XS        PRINT SCALE FACTORS
03000          VPRINT  7*32+7,YS
03010          DPRINT  8*32+7,XOFF      PRINT OFFSETS
03020          DPRINT  9*32+7,YOFF
03030
03040          JSR     $ADFB    WAIT FOR INPUT
03050          RTS
03060 M1       FCC     / XMIN:/
03070          FCB     0
03080 M2       FCC     / XMAX:/
03090          FCB     0
03100 M3       FCC     / YMIN:/
03110          FCB     0
03120 M4       FCC     / YMAX:/
03130          FCB     0
03140 M5       FCC     / XSCALE:/
03150          FCB     0
03160 M6       FCC     / YSCALE:/
03170          FCB     0
03180 M7       FCC     / XOFF  :/
03190          FCB     0
03200 M8       FCC     / YOFF  :/
03210          FCB     0
03220 M9       FCC     / <PRESS ANY KEY TO STOP>/
03230          FCB     0
03240
03250 PART2    CLR     $6       NUMBER VARIABLES
03260 AGAIN    CLRB
03270          JSR     $BC7C
03280          JSR     $BF1F    RANDOM(0)
```

```
03290 P1TST   LDX    #P1
03300         JSR    $BC96
03310         CMPB   #1
03320         BEQ    P2TST
03330         CLRB
03340         BRA    COLOR2
03350 P2TST   LDX    #P2
03360         JSR    $BC96
03370         CMPB   #1
03380         BEQ    P3TST
03390         LDB    #1
03400         BRA    COLOR2
03410 P3TST   LDX    #P3
03420         JSR    $BC96
03430         CMPB   #1
03440         BEQ    P4TST
03450         LDB    #2
03460         BRA    COLOR2
03470 P4TST   LDB    #3
03480 COLOR2  LDX    #COLOR
03490         LDA    B,X
03500         STA    $B5      CURRENT COLOR
03510         LDA    #5
03520         MUL
03530         STB    WHICH
03540         LDX    #ADATA
03550         ABX
03560         JSR    $BC14
03570         LDX    #XX
03580         JSR    $BACA
03590         LDX    #TEMPX
03600         JSR    $BC35
03610
03620         LDB    WHICH
03630         LDX    #BDATA
03640         ABX
03650         JSR    $BC14
03660         LDX    #YY
03670         JSR    $BACA
03680         LDX    #TEMPX
03690         JSR    $B9C2
03700         LDX    #TEMPX
03710         JSR    $BC35
03720
03730         LDB    WHICH
03740         LDX    #EDATA
03750         ABX
03760         JSR    $BC14
03770         LDX    #TEMPX
03780         JSR    $B9C2
03790         LDX    #TEMPX
03800         JSR    $BC35
03810         LDX    #XS
03820         JSR    $BACA
03830         JSR    $B3ED
03840         ADDD   XOFF
03850         STD    ACROSS   A*X+B*Y+E+XOFFSET
03860
03870         LDB    WHICH
03880         LDX    #CDATA
03890         ABX
03900         JSR    $BC14
03910         LDX    #XX
03920         JSR    $BACA
03930         LDX    #TEMPY
03940         JSR    $BC35
03950         LDB    WHICH
03960         LDX    #DDATA
03970         ABX
03980         JSR    $BC14
03990         LDX    #YY
04000         JSR    $BACA
04010         LDX    #TEMPY
04020         JSR    $B9C2
04030         LDX    #TEMPY
04040         JSR    $BC35
04050         LDB    WHICH
04060         LDX    #FDATA
04070         ABX
04080         JSR    $BC14
04090         LDX    #TEMPY
04100         JSR    $B9C2
04110         LDX    #TEMPY
04120         JSR    $BC35
04130         LDX    #YS
04140         JSR    $BACA
04150         JSR    $B3ED
04160         ADDD   YOFF
04170         STD    DOWN     C*X+D*Y+F+YOFFSET
04180
04190         LDX    #TEMPX
04200         JSR    $BC14
04210         LDX    #XX
04220         JSR    $BC35    NEWX
04230         LDX    #TEMPY
04240         JSR    $BC14
04250         LDX    #YY
04260         JSR    $BC35    NEWY
04270
04280         LDD    ACROSS
04290         LBMI   AGAIN    BRANCH IF X<0
04300         CMPD   #255
04310         LBGT   AGAIN    BRANCH IF X>255
04320         LDD    DOWN
04330         LBMI   AGAIN    BRANCH IF Y<0
04340         CMPD   #191
04350         LBGT   AGAIN    BRANCH IF Y>191
04360         P4PSET ACROSS+1,DOWN+1
04370         JSR    [$A000] ANY KEY PRESSED?
04380         LBEQ   AGAIN
04390         RTS
04400 FACTOR  FDB    $810C    1.1 IN FLOATING POINT
04410         FDB    $CCCC
04420         FCB    $CD
04430 X1      RMB    5        XSCALE
04440 X2      RMB    2        XOFFSET
04450 X3      RMB    5        MAXX
04460 X4      RMB    5        MINX
04470 Y1      RMB    5        YSCALE
04480 Y2      RMB    2        YOFFSET
04490 Y3      RMB    5        MAXY
04500 Y4      RMB    5        MINY
04510         END    START
```


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Classic Solitaire: Three games in one. Klondike, Canfield and Pyramid on one disk for just $14.95

La Belle Lucie: Very addicting. Once played, this solitaire quickly becomes a favorite. $14.95

All play on 128K CoCo3, with joystick and disk.

**Solitaire Special: Both disks for just $25.00!**

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Kyum-Gai -To Be Ninja. OS9 Version (512K/OS9) $29.95
Zenix (CoCo3 128K Disk) $29.95
Crystal City (CoCo3 128K Disk) $34.95
Armchair Admiral (CoCo3 128K Disk) $14.95
Riddle of the Ring (CoCo3/CoCo2 128K Disk) $10.00
Games Pack (CoCo3/CoCo2 128K Disk) $10.00

**Software submissions invited**

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# Proven

## On the Razor's Edge of

# The New Frontier:

# The Most Advanced Color Computer Drive Systems Ever Offered!

### Fast No-Halt SCSI Floppies Using Optional SCSI Controller

### Proven Performance for Demanding Home or Business Users

This is the most advanced, fully assembeled CoCo hard drive system offered. **Using the optional OMTI 5200 SCSI controller with our Hard Drive Interface, our new system will support no-halt floppy drives.** You need not wait while typing or worry about clock time losses. Why be limited to 3 floppy drives? A complete system could now consist of 1-3 standard CoCo floppy drives, 1-2 (or more) hard drives, and 1-3 no-halt floppies using standard (not just CoCo) OS/9 format. You can use single or double-sided 40 or 80 track drives with the SCSI no-halt controller.

There are several new features with this improved interface. These include:

- **Full SASI/SCSI compatible (this allows many add-ons to the versatile SCSI buss)**
- **No-Halt Floppies with optional SCSI controller allows full type-ahead during access**
- **Low factory-direct prices**
- **Fast Delivery from factory stock**
- **Optional Real Time Clock with built in battery (3-10 year lifetime)**
- **With the Clock you have 240 Bytes of battery backed up RAM for password protection or data storage!**
- **Same super stable LRTech quality**

**Interface Price only: $85.**

**Real Time Clock-RAM: $25.**

**20 or 30 Meg. 40 Meg. 80 Meg.**

**System Prices:** (Includes Hard Drive, case, & fan, SCSI Controller*, LR/OWL Interface, Software. Fully assembled and tested.)

**$495. $535. $875.**

**Super System Prices:** (LR/OWL System as above but OMTI 5200 SCSI Controller AND 3.5" or 5.5" HD 80 Track Floppy in same case)

**$595. $645. $1039.** (2 cases)

*SCSI controller is OMTI 5100. Add $75 for OMTI 5200 with FDC.

## Introducing the *Quick-Link*™ Interface

**Provides both a 64K Printer Buffer and Serial and Parallel Interfaces.**

**Serial to Parallel Printer Interface (64K Buffer) $65.**

Converts serial computer output to parallel printer and also provides a 64K buffer in front of the printer. Serial side Female DB-25 and Parallel side is Centronics. Includes Centronics to Centronics cable and power AC-adapter. If you need an adapter from the CoCo 4-pin serial to DB-25 add $9. From 300-38,400 Baud.

**Parallel to Serial Interface (64K Buffer) $45.**

Same as above except it converts Centronics parallel computer output to DB-25 Female serial. Plug into an IBM printer cable to provide output to a serial plotter.

**Parallel to Parallel (64K Buffer) $39.**

This is parallel printer buffer with no conversion.

### Drive System Parts

**Hard Drives**

| | | |
|---|---|---|
| 20/30 Meg | ST/PTI | $229. |
| 40 Meg | PTI | 265. |
| 80 Meg | ST4096 | 590. |

**SCSI Controllers**

| | | |
|---|---|---|
| OMTI 5100 | HD Only | $79. |
| OMTI 5200 | HD/FD | 169. |
| OMTI 5400 | HD/FD/Tape | 199. |

(Note: We have no drivers for tape yet)

**Cases and Cables**

| | |
|---|---|
| Case, 45 Watt PS, Fan | $105. |
| Cable set (3 pieces) | 25. |

Drives have a 1-year limited warranty. Other parts are 90-day warranty. Please Note - At these prices, only very limited support can be given.

# Technology

## the Color Computer Frontier


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**Order Numbers (only)**
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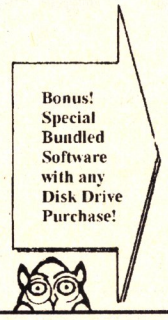
**1-215-682-6855**
**Fax: 1-215-837-1942**
**Technical Help**
**1-215-837-1917**


# DISK DRIVES




## Floppy Drive Systems

**The Highest Quality for Years of Service**

**Drive 0 Systems** (Half Height, Double Sided, Direct Drives) **$189.**

**Drive 0 systems complete with drive, controller, legal DOS, cable, case, power supply, and manual**

**Drive 1 Systems** (Half Height, Double Sided, Direct Drives) **$115.**

**New 3.5", 720K Drives for OS-9** with case & Power Supply **$149.**

**Drive 1 Systems have drive, case, power supply. (You may require optional cable and/or DOS chip to use)**

**Special for 0/1 Combos (0,1,2,3) $259.**

**SALE Prices on Drives!**

**HALF- HEIGHT DRIVE UPGRADES FOR RS HORIZONTAL CASES**

Why only double the capacity of your system when you can triple in the same case? Kit includes: double-sided to fit your case, chip to run both sides of new drive, hardware, and detailed instructions. Easy! Takes only 5 minutes!

**Model 500 , 501, or 502 Only $119.**

All drives are new and fully assembled. We ship only FULLY TESTED and CERTIFIED at these low prices. We use Fuji, YE Data, and other fine brands. No drives are used or surplus unless otherwise stated to you when you order. We appear to be the one of the few advertisers in Rainbow who can truly make this claim. We have 7 years experience in the CoCo disk drive market! We are able to provide support when you have a problem.

**Drives 1 Year Warranty**

**OWL WARE Software Bundle**

**Disk Tutorial/Utilities/Games**

**DISK TUTOR Ver 1.1**

Learn how to use your disk drive from this multi-lesson, machine language program. This tutor takes you through your lessons and corrects your mistakes for a quick, painless disk drive introduction. (This professionally written tutor is easily worth the bundle's total price.)

**3 UTILITIES**

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**2 GAMES**

We will select 2 games from our stock. These are sold for more than $20 each.

Do not mistake this software with cheap "Public Domain" software which others offer. All of this software is copyrighted and professional in quality. The tutor is unique with us and has helped thousands of new users learn their disk drive.

**only $27.95**
**(or even better)**
**only $6.95 with**
**any Disk Drive Purchase!!**

## 512K Upgrade

Again at a popular price. Fully assembled and tested before shipping. Easy to install. Uses fast 120 ns. chips.

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Now includes **memory test, Ram Disk Lighting, Printer Lighting, and Back-up Lighting.** All with an upgraded manual exclusive with OWL!

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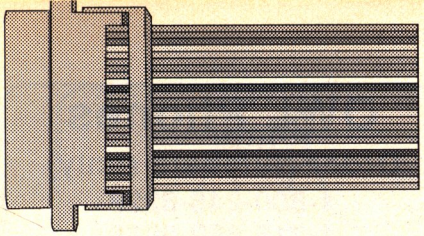
**Mertztown, PA 19539**





# More Dot Commands

by Eddie Kuns
OS-9 SIG Database Manager

Last month I introduced you to the most commonly used dot commands. There are quite a few other dot commands — more than I can mention in this space. Remember, the period for each dot command must be in the first column.

One of the simplest dot commands is `.blank`, which leaves a blank line (or you could use `.blank 5` to leave five blank lines). This command can be shortened to `.b`. To center a single line, use the `.center` (or `.c`) command, following the `.c` (on the same line) with a space and the text to be centered. You can use `.p` to start a new paragraph. However, a blank line works just as well. You would use `.p` to start a new paragraph only if you didn't want to leave a blank line between paragraphs, but a blank line usually improves readability.

If you want to be silly, you can use the `.!` command. Any text following this, on the same line, is for your eyes only — this is how you generate a comment line. This is perhaps the best and most polite way of telling someone off in the forums.

To indent a line of text five spaces, use the `.i 5` dot command. This command indents the next line (only) five spaces, but only if that line is the beginning of a new paragraph. You can even create hanging indentations — if you want to create a five-space hanging indentation, use the `.wm 5` dot command. All of the text is indented beginning at the next new line of text. Rather than wrapping to the left margin, the text wraps to five characters to the right of the left margin. Reset the word-wrap column to normal by using the `.wm 0` dot command.

```
Greg told me:

.lm 4 /annot=>
Eddie, your recent forum postings are just too silly.
.lm 0

In response to the allegations of silliness, I have
prepared a long, carefully worded,
response.

.page Do you want to read it?

First of all, here is a table of
my recent forum
postings and their silliness ratings

.lt
.lm 7
Month      # messages posted   # silly ones
========   ================   ============
January            27               17
February           20               15.2
March              35               10
.lm 0 /annot=
.el

So you can see that the number of inane messages I've posted has actually been
dropping.
.! OK, so no one will believe me!
.blank 2
.wm 5
Well, no one will probably believe me, but I just wanted to make
that point. It's done. So, as a final
.p
.i 30
flourish:
.wm 0

.c Eddie Kuns
```

**Figure 1: Sample Delphi Message (As Entered)**

Figure 1 shows a sample message as you would enter it on Delphi. The message uses many of the dot commands we've covered. Figure 2 shows the same text as someone reading the Forum message (or a database group description) would see it. (Don't take the sample too seriously, it was written after midnight!)

Notice in the example that the `/annot` setting remains until you change it. Any text that is indented away from a left margin of zero, will be annotated with the currently set `/annot` value. This includes text indented by `.i`, `.c`, `.lm` and `.wm`.

If you want more information on dot commands, look for VAX/VMS documentation of the RUNOFF text formatter.

Now that you know how to format your messages, how do you edit the message to include all those formatting commands?

*Eddie Kuns is pursuing a PhD in physics at Rutgers University. He lives in Aurora, Illinois, and works as a programmer and researcher at Fermilab. Eddie is co-manager of the CoCo SIG; his username is EDDIEKUNS.*

```
Greg told me:

>  Eddie, your recent forum postings are just too silly.

In response to the allegations of silliness, I have prepared a long, carefully
worded, response.

Do you want to read it?


First of all, here is a table of my recent forum postings and their silliness
ratings

>      Month       # messages posted    # silly ones
>      ========    ==================   ============
>      January           27                 17
>      February          20                 15.2
>      March             35                 10

So you can see that the number of inane message I've posted has actually been
dropping.


Well, no one will probably believe me, but I just wanted to make that point.
It's done. So, as a final

                              flourish:

                                   Eddie Kuns
```

**Figure 2: Sample Delphi Message (As It Appears)**

Well, you can enter them online using one of Delphi's editors. However, you can be more frugal if you edit those long formatted replies offline and then upload them when you are finished. This also allows you to use your favorite editor.

If you want to include text from a Forum message in your reply, use the Forum command `FILE` *filename.txt* to place a copy of the current forum message in your workspace as *filename.txt*. You can then download this file from your workspace and delete it afterwards. Keep track of the message number to which you are replying.

Once you have edited your reply, upload it to your workspace. Then enter Forum and type the command

`REPLY` *number filename.ext*

where *number* is the message number to which your reply is directed and *filename.ext* is the name of your reply in Workspace. Please use `REPLY` rather than `ADD` — it gives people a context to look back at if they do not understand your message.

### Notify

One slash command I haven't covered yet is `/NOTIFY`. This command is an intelligent `/SEND` — it sends a message to every SIG *staff member* who is online. If you are in the CoCo SIG and want to join a scheduled conference, but have never used conference, you could enter

```
/notify How do I enter conferenc
e from the Forum> prompt?
```

If there are no SIG staff members online or they are all busy, you will see "Sorry, nobody could be notified." Otherwise you'll see "Notification sent." Remember, the people receiving your question may be in mail or somewhere else where they cannot immediately reply.

### Databases

One of the most important changes in the OS-9 database reconstruction pertains to keywords. Occasionally, users complain because they cannot find something in the databases. Until now, there has been no real standard for assigning keywords. Greg Law recently took a close look at the keywords attached to groups in the databases and decided to set a standard. The new standard dictates the following keywords should be included:

- Primary Keyword (depends on the database)
- Username of the uploader
- Username or last name of the author, if different from uploader
- Company name (if it refers to a commercial product)
- Company acronym (if appropriate)
- Product name or filename
- Descriptive Keywords

I will give some keyword examples next month. For now, there are a great many examples in the databases. Please follow this standard and think about the keywords you assign. Remember, when entering keywords enter each on a separate line. Keep descriptive keywords short, two words maximum, and use only keywords you think people will actually use to find the group. Use the description section, not the keywords, to describe the files in the group.

### April Uploads

**Frank Hogg** and **Paul Ward** posted more press releases about their companies' new computers. **Guy Loucks** uploaded **Bruce Isted's** *KUtil*, a utility that makes it easier to patch OS-9's Kernel. He also contributed a patch to the Kernel (using this utility) that allows OSK-compatible filenames. **Philip Brown** released the latest version of his port of *Micro Emacs*. Although the edit buffer is small, this is a full implementation of *Micro Emacs V3.10*.

**Andrew Thibodeau** posted the protocol for IFF graphics. If anyone wants to write an IFF viewer, the information is here! **Steve Flock** contributed several games. In Programmer's Den, **Tim Kientzle** released the latest version of his `cstart.r` replace-

## Database Report

### OS-9 SIG

**General Information:**

```
TIGER INTRO
FHOGG          Frank Hogg
IMS DESCRIBES NETWORK FOR MM/1
PKW            Paul K. Ward
WHAT IMS HAS BEEN UP TO!
PKW            Paul K. Ward
```

**Applications:**

```
DBL - PRINT DOUBLE SIDED
WOAY           Jim Martin
DECOMPRESS DYNASPELL'S DICTIONAR
BARSENAULT     Bruce Arsenault
KUTIL - COPY KERNEL TO DISK
GUYLOUCKS      Guy Loucks
PRINTFORM REVISED
WOAY           Jim Martin
UEMACS V3.0: LIMITED.
THEFERRET      Philip Brown
```

**Device Drivers:**

```
AUTO BOOT EPROM
STEVEHILTON    Steve Hilton
OS-9 KERNEL PATCH
GUYLOUCKS      Guy Loucks
```

ment. This version fixes a couple of minor bugs from the previous version. **Tony Schountz** uploaded some graphics tools for Pascal.

In the 68K-OS9 database, **Ed Gresick** released several useful files: *CMenu* and *TED* form **Mike Sweet's** popular *Ed* editor, ported to UNIX. He also posted `tar` and `compress` binaries for OSK, and `screen`. `screen` allows multiple windows under OSK or UNIX.

In the CoCo SIG, **Marty Goodman** and **Don Hutchison** posted a number of articles to General Information. "Encounter with a Tornado" describes **Joel Hegburg's** dramatic near-encounter with a funnel cloud. Marty also posted his RAINBOWfest report. Don Hutchison posted a funny list of computer terminology and a couple lists of BBSs.

April saw the smallest number of uploads to the CoCo 3 Graphics database in recent history! **Dan Monday** released a new *MGE* slide-show program. **Kelly Thompson** contributed **Roger Taylor's** maze game, *Peliete*. In Soapbox, Marty Goodman uploaded a couple of articles against Motorola's random drug testing program — including a humorous article describing Motorola's anti-theft policy, which was originally posted on the Chicago USENet.

### Conferences

The newest conference is weekly: **Rick Adams** (RICKADAMS) and **John Farrar** (TRIX) jointly host a weekly conference on "The Art and Science of UUCP." If you have any questions or suggestions, now you know where to send them. This conference takes place every Friday at 10 p.m., EST.

❑

## Database Report (continued)

**Graphics & Music:**

| | |
|---|---|
| 2 FLICKER VEF NUDES | |
| BOYNGER | David Boynton |
| WILD WEST POKER | |
| HAYD | Dennis Hay |
| GEMQUEST.PAK | |
| RESLER | Floyd Resler |
| VARIOUS GIF FILES | |
| BOYNGER | David Boynton |
| 3 BBS LOGIN BILLBOARDS | |
| JSUTEMEIER | Jim Sutemeier |
| MFF120 AND MFPLAY_MEM | |
| PAULSENIURA | Paul Seniura |
| STARII STARLANES REVISED | |
| RICKMOU | Rick Moutoux |
| MANDELBROT EXPLORER! | |
| THEJAILER | Steve Flock |
| FRACTAL DECODER | |
| THEJAILER | Steve Flock |
| ZAP, A SPACE GAME | |
| THEJAILER | Steve Flock |
| BONK - GAME | |
| THEJAILER | Steve Flock |
| IFF GRAPHICS PROTOCAL INFO | |
| THIB | Andrew Thibodeau |
| ADVENT TEXT ADVENTURE | |
| CZO | Chuck Owens |
| SOME FAMOUS ACTRESSES IN MAC PIX | |
| GRAPHICSPUB | Bob Montowski |
| WAR IS HELL | |
| GRAPHICSPUB | Bob Montowski |
| WISH YOU WERE HERE | |
| GRAPHICSPUB | Bob Montowski |
| 3 LOVELY LADIES AT BATH TIME | |
| GRAPHICSPUB | Bob Montowski |

**Programmers Den:**

| | |
|---|---|
| TERMCAP QUICKIE HACK | |
| THEFERRET | Philip Brown |
| PASCAL09 PROGRAMMING ENVIR. | |
| TONYSCHOUNTZ | Tony Schountz |
| CSTART.R MODULE | |
| TIMKIENTZLE | Tim Kientzle |
| PASCAL GRAPHICS | |
| TONYSCHOUNTZ | Tony Schountz |

**68K-OS9:**

| | |
|---|---|
| CMENU AND TED (UNIX) | |
| EDELMAR | Ed Gresick |
| SCREEN - WINDOWS FOR OSK | |
| EDELMAR | Ed Gresick |
| TAR AND COMPRESS FOR OSK | |
| EDELMAR | Ed Gresick |

**Tutorials & Education:**

| | |
|---|---|
| WELCOME LETTERS | |
| BOBKEMPER | Robert Kemper |

**Standards:**

| | |
|---|---|
| OPEN LETTER ON STANDARDS FOR OS9 | |
| JOELAV | Joel Ewy |

### CoCo SIG

**General Information:**

| | |
|---|---|
| ENCOUNTER WITH A TORNADO | |
| MARTYGOODMAN | Marty Goodman |
| CHICAGO 1991 RFEST REPORT | |
| MARTYGOODMAN | Marty Goodman |
| NIGHTMARE AT SYKES CAMP | |
| MARTYGOODMAN | Marty Goodman |
| COMPUTER TERMINOLOGY | |
| DONHUTCHISON | Don Hutchison |
| MEDICAL BBSES | |
| DONHUTCHISON | Don Hutchison |
| GOVERNMENT BBSES | |
| DONHUTCHISON | Don Hutchison |

**CoCo 3 Graphics:**

| | |
|---|---|
| MGE VIEWER 101 | |
| DANMONDAY | Dan Monday |
| TWEED SISTERS | |
| SINCLAIR1 | Craig Wells |
| PEPSI-COCO | |
| COCOMARQUIS | Tika Carr |
| COCO MAX III PICTURES SET I | |
| COCOMARQUIS | Tika Carr |
| IMG SPACE PICTURES | |
| SANNUCCI | Joe Sannucci |

**Utilities & Applications:**

| | |
|---|---|
| COCOLOG REVISED FOR 80 TRK DISKS | |
| REDCOAT | Don Joyce |

**Games:**

| | |
|---|---|
| PELIETI - MAZE GAME | |
| KMTHOMPSON | Kelly Thompson |

**Music & Sound:**

| | |
|---|---|
| CRY FOR HELP - ASTLEY | |
| BAWILLIAMS | Bob Williams |
| JOYRIDE BY ROXETTE | |
| BAWILLIAMS | Bob Williams |

**Archives:**

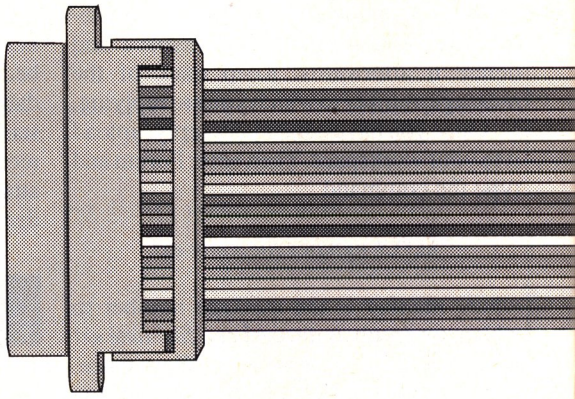
| | |
|---|---|
| POLL:IBM VS. COCO VS. COMMODORE | |
| JIMREED | Jim Reed |
| POLL: IS VERIFY NEEDED | |
| JIMREED | Jim Reed |
| POLL: DO YOU LOVE ULTIMATERM | |
| JIMREED | Jim Reed |

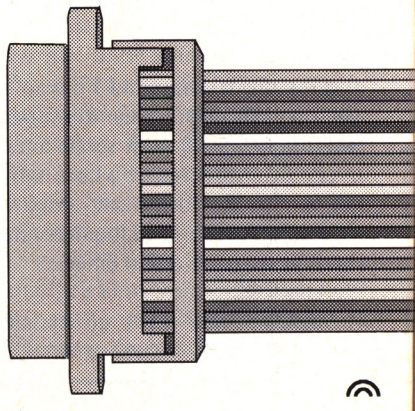
**Product Reviews & Announcement:**

| | |
|---|---|
| NEW GRAPHICS PICTURE SETS FOR SA | |
| STEVEPDX | Steve Ricketts |

**Soapbox (chitchat):**

| | |
|---|---|
| AGAINST RANDOM DRUG TESTING | |
| MARTYGOODMAN | Marty Goodman |
| MOTOROLA EMPLOYEE TESTING | |
| MARTYGOODMAN | Marty Goodman |





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**ISSUE #95, MAY 1990**
DREAMTIME ADV.
XT/AT SYSTEMS
BIBLE QUIZ 2
16 FLAGS
FRACTIONS
SOLITAIRE PUZZLE 4
512K RAM DRIVE 3
FOOD FACTORY 3
WHO PART 2
**TRAPFALL**

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DR. PHRED!
PRINTER FONT CODES
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PLANE EXPLORER
WHO PART 3
**MS. MAZE**

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AIR WAR 3
**SKRAMBLE**

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SPACE WAR 3
MAZE MASTER 3
**WIZARD'S DEN**

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TELESALE CONTACTS
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PROPOSAL WRITER
ALPHABET SCRAMBLE 3
MAGIC PUMPKIN
DR. WHO3 PART 4
**FANGMAN**

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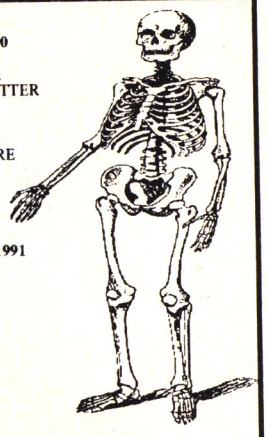
ZOT MIND GAME
SUPER TEXT EDITOR
SUPER TEXT FORMATTER
TURTLE SEARCH 3
COAST TO COAST
EASY BASIC 3
DRAGON ADVENTURE
WRITE OUT UTILITY
TRY THIS
**DONUT DILEMMA**



**ISSUE #101, NOV. 1990**
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COST ESTIMATOR
SALO INVENTORY
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ALAIX - 3
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512K RAM CAT. 3
Bingo Caller 3
DUCK HUNT
**THE FROG**

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SUPER SCREEN DUMP
KEYBOARD REMAP
**CRASH**

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PIG OUT
CRYPTOGRAM 3
GHOST HUNTER
HI-COPY
LEARN!
**SR-71**

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ANTIQUE COLLECTOR
FOUR SCORE
QUICK TAX
HI-LOAD
QUAD EDUCATION 3
SMURF QUEST 3
**BUZZWORM**

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SERVICE MANAGER
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GR4 - 22 Coco Max Pictures
GR5 - 22 Coco Max Pictures
GR6 - 22 Coco Max Pictures
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|---|---|---|---|---|---|---|---|
| 1 | 16 | 31 | 46 | 61 | 76 | 91 | 106 |
| 2 | 17 | 32 | 47 | 62 | 77 | 92 | |
| 3 | 18 | 33 | 48 | 63 | 78 | 93 | |
| 4 | 19 | 34 | 49 | 64 | 79 | 94 | |
| 5 | 20 | 35 | 50 | 65 | 80 | 95 | |
| 6 | 21 | 36 | 51 | 66 | 81 | 96 | |
| 7 | 22 | 37 | 52 | 67 | 82 | 97 | |
| 8 | 23 | 38 | 53 | 68 | 83 | 98 | |
| 9 | 24 | 39 | 54 | 69 | 84 | 99 | |
| 10 | 25 | 40 | 55 | 70 | 85 | 100 | |
| 11 | 26 | 41 | 56 | 71 | 86 | 101 | |
| 12 | 27 | 42 | 57 | 72 | 87 | 102 | |
| 13 | 28 | 43 | 58 | 73 | 88 | 103 | |
| 14 | 29 | 44 | 59 | 74 | 89 | 104 | |
| 15 | 30 | 45 | 60 | 75 | 90 | 105 | |

Public Domain

| | | | | |
|---|---|---|---|---|
| M1 | GR1 | E1 | U1 | GA1 |
| M2 | GR2 | E2 | U2 | GA2 |
| M3 | GR3 | E3 | U3 | GA3 |
| M4 | GR4 | E4 | U4 | GA4 |
| M5 | GR5 | | U5 | GA5 |
| M6 | GR6 | H1 | U6 | GA6 |
| M7 | GR7 | H2 | U7 | GA7 |
| | GR8 | H3 | U8 | GA8 |
| A1 | GR9 | H4 | | GA9 |
| A2 | GR10 | | | GA10 |
| | GR11 | | | GA11 |
| T1 | GR12 | | | |
| T2 | GR13 | | | |
| T3 | GR14 | | | |

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# Ultralace: Tying the Knot

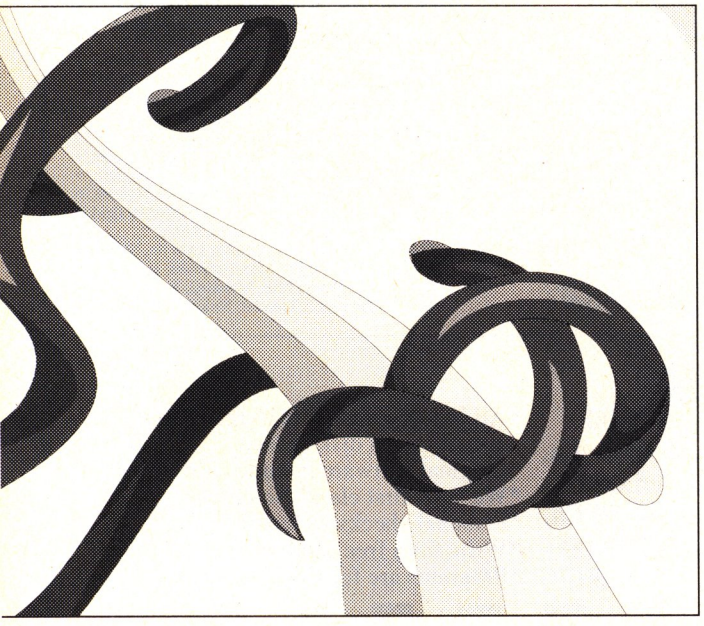
**by H. Allen Curtis**

*Instructions for using both versions of the CoCo 3 desktop publisher*

From previous articles in this series, you should have learned many fundamentals of *Ultralace* operation. This last installment discusses the fine points, as well as the fundamentals, of *Ultralace* operation. Explanations of *Ultralace* command usage are provided.

### Adding Graphics

Through previously given hints and experimentation you should know how to select (using the A command) a design or its mirror image in any of three sizes. You should also know how to draw the design using the SHIFT-right-arrow combination. Drawing artwork that consists of images in two or more slots of the Design menu requires the ability to draw the two images, one immediately below the other. For correct vertical spacing of the images, you must be using a compatible font. There are four font sizes: 8, 12, 16 and 24 dots in height. Fonts 8 and 16 are compatible with designs from any of the four rows of the Design menu no matter which design-size option you choose. Fonts 12 and 24 are compatible only with designs chosen from the bottom two rows of the Design menu. Table 1 lists the fonts by height. Correct horizontal alignment of the upper and lower design sections is accomplished with the *Ultralace* Tab feature.



The following two examples should help you when drawing artwork composed of two or more sections. For the first example, suppose that you want to draw the rabbit found in Row 1 of the Design menu. For this you must use a font of 8 or 16 dots. Choose any available font from the 8- or 16-dot column of Table 1. Return to the *Ultralace* screen using the B command. The cursor is initially positioned in the top-left portion of the screen. Move the cursor to a convenient place for drawing the rabbit at twice its normal width and length. Cursor placement is as follows: Press the CTRL key and then press the right arrow. Press any key to stop the cursor at the desired place (near the middle). Next, press the down arrow twice. With the position established, press F2 to get the Command menu. Use the T command to set the Tab key (the CLEAR key). Press C when asked for each of the two Tab values. The C stands for *current cursor position*. Next, use the A command to select a design. To select the upper part of the rabbit at twice its width and length, choose Option 3 of the Design menu option list. To select the top part of the rabbit, press 1 followed by a lowercase o. If you mistakenly type an uppercase O, you will hear a beep indicating you should try again. When you return to the *Ultralace* screen, press the SHIFT key and then press the right arrow to draw the upper half of the rabbit, which is twice the normal height at 64 dots high. Therefore, if you use a 16-dot font, press the down arrow four times. Otherwise, press the down arrow eight times. Next, press CLEAR for the correct position from which to draw the lower part of the rabbit. Go to the Command menu and use the A com-

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mand again with Option 3. From the Design menu, select the lower half of the rabbit by pressing 1 followed by a lowercase p. When you return to the *Ultralace* screen, hold down the SHIFT key and press the right arrow to complete the image of the rabbit.

The second example is presented in less detail to let you apply the knowledge gained in the first example. Let's draw CoCo Cat in its normal size (96 dots by 96 dots). Press SHIFT-CLEAR to clear the *Ultralace* screen. Position the cursor to draw CoCo Cat. Use the cursor position as a tab setting as in the previous example. When drawing CoCo Cat, you must use the A command four times with Option 1. Press 2e, 2f, 3e and 3f to select the top-left, top-right, bottom-left and bottom-right sections, respectively. After you select the top-left portion of CoCo Cat, draw it on the *Ultralace* screen. Then without moving the cursor, select the top-right part of CoCo Cat and draw it. Press CLEAR to move the cursor to its tab position. Press the down arrow 6, 4, 3 or 2 times, depending on whether the current font is 8, 12, 16 or 24 dots, respectively. You do not need to count the number of times you press the down arrow since it will be obvious when the cursor reaches the proper position. Select the lower left portion of CoCo Cat and draw it. Similarly, select and draw the lower-right portion to obtain CoCo Cat in his (her?) entirety. If you want a mirror image of CoCo Cat, complete the same steps but select the four parts in the following order: Top-right, top-left, bottom-right and bottom-left.

The other multiple-part images on the Design menu include Uncle Sam (top and bottom), a parrot (top, middle and bottom), an eagle (four parts) and the Statue of Liberty (four parts).

| Height | 8 | 12 | 16 | 24 |
|---|---|---|---|---|
| Font | B | E | A | C |
| | J | F | I | D |
| | | G | K | M |
| | | H | Q | O |
| | | L | S | R |
| | | N | U | T |
| | | .P | W | X |
| | | V | | |
| | | Y | | |

**Table 1: Ultralace Fonts**

As you have seen in the preceding examples, the CLEAR key operates much like a Tab key on a typewriter. Once the Tab position is set, the Tab key moves the cursor (instead of the typewriter carriage) to the specified position. The T command sets two tab positions. In the examples above, both positions were assigned the same value for the sake of simplicity. Suppose you want to construct a two-column table on the *Ultralace* screen, and you want the columns to start one-quarter and five-eighths of the way across the 640-dot screen. In such a case, you would use the T command and type 160 for the first entry and 400 for the second entry. Then, when typing each line of the table, you would press CLEAR to find the starting position of the first column. When information for that column has been entered, press CLEAR again to locate the starting position of the second column.

Ordinarily, the *Ultralace* screen uses an HSCREEN3 resolution of 640 dots by 192 dots (Mode 3). *Ultralace* can operate with an HSCREEN1 resolution of 320 dots by 192 dots (Mode 1). Use the R command to change the *Ultralace* screen resolution from Mode 3 to Mode 1, or vice versa. The sole reason for switching to Mode 1 is to allow printing of font characters at double width. Any character written on the Mode 3 screen appears garbled in Mode 1. However, the characters printed on the Mode 1 screen are unchanged when *Ultralace* is switched back to Mode 3. To see what I mean, select Font N by using the F command. Type your name on the Mode 3 screen, then use the R command to switch to Mode 1. Under the garbled version of your name, type your name again. Use the R command to return the screen to Mode 3. Note that the screen now has your name clearly printed with regular and double-width fonts. Designs cannot be drawn with the screen in Mode 1. If you try to do so, a beep reminds you to change the screen resolution to Mode 3.

### Multiple Columns

The ultimate purpose of *Ultralace* is to produce attractive printed documents. Printing is accomplished through any of three screen dumps — 1-, 2- and 3-column printouts. Each column of these printouts consists of the images of four *Ultralace* screens. Before you can use any of the screen dumps, you must have written 4, 8 or 12 screens (depending on the number of columns you are using) and saved them to disk. The three screen dumps have different printed-page margin requirements. The 2- and 3-column screen dumps also require you to specify the spacing between columns. These margin and column-spacing requirements correspond to similar screen requirements that must be set before a screen is written. The H command automatically takes care of the "housekeeping" chores of setting screen margins. Select H from the Command menu for an auxiliary menu that lists three options for the number of columns you want for your printout. After you select the appropriate option by pressing 1, 2 or 3, the H command specifies the correct screen margins for the desired screen dump.

The screens should not be saved on the File Disk containing ULT (or ULE) and its auxiliary files. If you have only one disk drive, you have to do some disk swapping. The D command helps you keep track of the contents of the disk (or disks) in the drive(s). The D command provides the same information as the Disk BASIC DIR command, and also informs you as to how many granules are still free.

After you have generated a physical screen of text and have already executed the H command, you need to employ the O command to save the screen. From the Command menu, press O. You are asked to specify a filename for the screen file to be saved. You must answer by entering a filename with six or fewer characters. Suppose you enter MYDOC as the filename. Under control of information furnished by the previous H command, two other characters are appended to the filename. If you want the screen saved on a disk in a drive other than Drive 0, you must type a colon and the drive number immediately after the filename. If you are preparing for a 1- or 2-column screen dump, each screen is saved in two files: MYDOCL1.HR1 and MYDOCL1.HR2. Only half a physical screen is saved for a 3-column screen dump. The saved file would be MYDOCL1.HR. You can use the D command to verify the files have been saved.

For a 3-column printout, each column requires 320 dots or less horizontally. A half screen is sufficiently large to provide the required number of dots. A 3-column screen dump requires 12 half screen files (48 granules) that can be readily recorded within the 68-granule capacity of a 35-track disk. When you return to the *Ultralace* screen after saving a half screen, you will notice the screen has been transformed. The transformation facilitates the saving process and leaves unchanged the portion of the screen that you generated.

After you print each of the next three screens, you need to use the O command, but you are no longer required to supply a filename. Each use of the O command for the 2-column screen dump produces successive pairs of files: MYDOCL2.HR1 and MYDOCL2.HR2, MYDOCL3.HR1 and MYDOCL3.HR2, and MYDOCL4.HR1 and MYDOCL4.HR2.

For the 3-column screen dump, the files saved for the left column are MYDOCL2.HR, MYDOCL3.HR, and MYDOCL4.HR. The files saved for the middle column are MYDOCM1.HR, MYDOCM2.HR, MYDOCM3.HR and MYDOCM4.HR. The right column is saved as MYDOCR1.HR, MYDOCR2.HR, MYDOCR3.HR and

MYDOCR4.HR. If you are preparing for a 2- or 3-column screen dump, the margin settings of subsequent columns are automatically specified. Again, after you write each of the four screens that comprise a single column, the O command saves the screen without you typing a filename.

When you have saved all the files you need for the screen dump of your choice, make sure your printer is ready. For a 1-, 2- or 3-column screen dump to work properly there must be a full complement of 4, 8 or 12 screen files, respectively, on the disk. Therefore, *if you finish your intended document using less than the required number of screens, you must complete the set of screen files by saving blank screens.* Next, select the S command from the Command menu. You are greeted with an auxiliary menu that lists the three screen dump choices. Enter the number that corresponds to the screen dump you want and the screen-dump process begins. The files containing images of the top quarter of the printout are automatically loaded into *Ultralace* memory. (For the 3-column screen dump, the files loaded are MYDOCL1.HR, MYDOCM1.HR and MYDOCR1.HR.) Then the printing starts. When the top quarter has been printed, each of the other three quarters are handled in a similar manner.

**Using a Word Processor**

In addition to writing *Ultralace* screens directly from the CoCo 3 keyboard, you can prepare a document with your favorite word processor, save the document as an ASCII file and load it into *Ultralace* for automatic onscreen printing in the font of your choice.

*Ultralace* accepts ASCII files from any CoCo word processor — the files may contain no embedded codes, no printer-control codes, no hyphenated line endings, and no characters not in an *Ultralace* font. In addition, there are further modifications you must make to the ASCII file.

You must append the [ character (produced by pressing the SHIFT-down-arrow combination) to the end of any line you do not want wrapped, provided the line does not start with one or more spaces. For example, in a letter, each line of the name and address of the person to whom you are writing would probably need to be terminated with a [. This would prevent the name and address from wrapping onto one line.

You must also append the ] character (produced by pressing the SHIFT-right-arrow combination) to the end of the final line of the document. For a long document it is preferable (for smoother *Ultralace* handling) to save a number of ASCII files, each containing about one typed page. Such files must be terminated with a ].

Files produced using a word processor can be saved on a disk destined for the screen files of a 1- or 3-column screen dump. However, a 35-track disk does not have the capacity to support both word processor files and screen files needed for a 2-column screen dump. In such a case, you must save the word processor files on a separate disk and use disk swapping between screen-file and word-processor-file disks if you have only one disk drive. If you have a RAM disk, load the contents of the word processor file disk into it. Using a RAM disk for word processor files alone is a real convenience, whether or not the intended screen dump is for a 2-column printout. A RAM disk speeds the process of generating screens.

Even though you may have written each word-processor file in the ASCII form required by *Ultralace*, it must be converted to a standard form. The conversion is accomplished using the C command. With the word processor files in a RAM disk or on a disk in the drive, use the C command for each file. You are requested each time to enter the associated filename, in full, including its extension and drive number if different than Drive 0. The conversion takes a short time.

Use the I command to generate screens from the converted word processor files. The I command has four input options. Option 3, aptly labelled Word Processor File, is the one to use for loading the converted file on the *Ultralace* screen. After selecting Option 3, you are asked to enter the filename (no extension) and drive number (if 1, 2 or 3). You soon see the contents of the file being printed on the *Ultralace* screen.

As always, H command housekeeping initiates the process of generating and saving screens destined for one of the three screen dumps. A screen is written — either manually or by Option 3 of the I command. Use the O command to save each screen. Clear each screen before loading the next.

When the onscreen writing is completed, you can choose whether or not to have the remainder of the file saved in a different file called REST. Unless you want to rewrite the screen, starting at another place on the screen, you will choose to have the remainder of the file saved as REST. Thereafter, enter REST for the I command, Option 3 filename until the entire file has been written. When it has been written, screen printing stops. Then you need to press ENTER to position the cursor before loading the next converted file.

When using Option 3 of the I command to generate screens, you may occasionally want to move a line of characters to the left or right. You can accomplish this by pressing SHIFT and the up arrow. Unlike other keys and key combinations (listed with the K command), the use of this combination is not completely obvious. When moving it right or left, the printed line must generally begin or end with one or more spaces. To move a printed line to the right, you must position the cursor in the right half of the screen by pressing CTRL and the right arrow. Then, press SHIFT and the up arrow until the line has been moved the desired distance. Follow the same procedure to move the line to the left, but position the cursor in the left half of the screen by pressing CTRL and the left arrow.

The other I command options are not concerned with word processor files. Options 1 and 2 are used to load screen files. The main purpose of these two options is to examine and change screens that have been saved for a screen dump. Option 1 loads screens intended for a 1- or 2-column screen dump. Option 2 loads screens intended for a 3-column screen dump. When the I command prompts you to enter the filename, you must enter it in full (exclusive of the extension). This means that you must include the last two characters of the filename that were automatically appended when the file was originally saved. After making changes on a screen loaded with Option 1 or 2 of the I command, save it with Option 1 or 2, respectively, of the O command. During operation of the chosen option of the O command, you must enter the filename exactly as you did to load the screen. Options 1 and 2 of the O command can be used before or after — but not during — the execution of the complete process, including housekeeping, generating and saving all the screens for a screen dump.

Option 4 of the I command pertains to loading strings from STR.DAT, the file you generated with the program GENSTR. When you choose Option 4, you are presented with a menu of six choices. The first three choices are aids for drawing designs along the borders of the *Ultralace* screen. The strings of choices 1 through 3 are designed to work with normal- or double-width designs from Row 0 of the Design menu. Those strings should be used in conjunction with a 16-dot font. For the designs to be drawn along the borders of the screen, the top, left, right and bottom margins of the screen must be set to 0, 0, 640 and 191, respectively. These are the default margin settings. If you used the H command as part of the process of generating and saving the screens needed for a 2- or 3-column screen dump, the margins are no longer at their default settings.

You can set the margins manually by using the M command. To specify default margin settings in preparation for border-design string usage, select M from the Command menu. You are asked for the top,

left and right margin values. You must respond by entering 0, 0 and 640, respectively. You are then asked whether or not you want to change the bottom margin. Enter Y for yes. Enter N to answer the next question so the cursor is able to reach the lowest screen position that corresponds to a setting of 191. The M command is discussed in more detail shortly.

To use border-design strings, use the F command to select a 16-dot font, such as Font I. Use the M command to set the margins to their default values. Clear the screen by pressing SHIFT-CLEAR. Use the A command to select, in normal size, a design from Row 0. For example, use that in Slot G. With the cursor at the top-left corner of the screen, you are ready to draw the top border design. After you select I from the Command menu, choose Option 4. When the menu of choices is formed, select Choice 1, which draws horizontally normal-sized designs. The top border is quickly drawn, except for a 16-by-16-pixel space at the top-right corner of the screen. The cursor is now in position to draw the right border design. From the menu of choices in Option 4, select Choice 2. You might think you should use Choice 3, which draws designs vertically. Choice 3 draws designs vertically at the left border and everywhere else, but not at the right border. Strangely enough, either Choice 1 or 2 draws the right border design. When the right border is complete, position the cursor at the top left by pressing ENTER followed by CTRL and the up arrow. Now, use Choice 3 to draw the left border design. The cursor remains in position to draw the bottom border design via Choice 1, Option 4 of the I command. To draw a border around the screen with double-width designs, use the A command to select a double-width (32-by-16-pixel) design from Row 0 of the Design menu. Then carry out the example as before, but instead of selecting Choice 1 for top and bottom borders, select Choice 2.

The border design strings can also be used when the margins have been set by the H command. The procedure, however, requires slightly more manual positioning of the cursor. Rather than using the H command to establish margin settings, the M command is used to simulate the H command margin settings for the third column intended for a 3-column screen dump. Therefore, use M to set the top, left, right and bottom margins to 0, 0, 232 and 191, respectively, or 0, 0, 288 and 191, respectively — depending on whether you are using ULT or ULE. Use the A command to select a normal-sized design from Row 0 of the Design menu. Clear the screen. (In the following discussion, Option 4 has been taken when choices are mentioned.) Choice 1 is designed to draw 39 designs horizontally. With a right margin of 232 or 288, only 14 or 18 designs, respectively, can be drawn horizontally. After the 14 or 18 designs are drawn, each attempt at drawing the remainder of the 39 designs simply results in a beep. Choice 2 is designed to draw 19 designs horizontally. Therefore, it is more efficient to use Choice 2 for the previously shortened top and bottom borders, regardless of the size of the selected design. With the cursor at the top-left corner of the screen, select Choice 2. After the top border is drawn, press the left arrow (backspace) eight times to position the cursor for drawing the vertical border. Then use Option 3, since the vertical design is not to be drawn on the extreme right side of the screen. Position the cursor at the top left as in the previous example. Select Choice 3 to draw the left border design. Finish the rectangular border design by taking Choice 2. If you had been dealing with a double-width design, you would have completed the example in a similar way, except you would have pressed the left arrow 16 times to position the cursor to draw the right border.

Each of choices 4, 5 and 6 prints a string of characters on the screen. When you select Choice 4, your address is printed in characters from the current font. The printing begins at the current cursor position. When the first line of characters is finished, the second line is printed directly below the first. Choices 5 and 6 work in much the same way. When you use choices 4, 5 and 6, it is advisable to extend the right margin of the screen with the M command.

There are a few remaining remarks that should be made about the M command. If you merely want to change one of the margins — say the right margin — you need only enter a value for that margin. Just press ENTER for each of the other margins to retain its current value. Because the H command employs the default settings of 0 and 191 for the top and bottom margins, those margins are seldom changed. However, the top and bottom margins are changed automatically when you have printed a line or more on the screen and then change fonts. The top and bottom margins are changed in this case to provide a pleasing vertical spacing of the text in a line printed with mixed fonts.

Those of you who have Tandy DMP printers that print 960 dots instead of 800 dots across the page, will discover that a column composed of four screens is somewhat too long for a single page. Therefore, you will have to change the bottom margins for the fourth screen of each column. After you save three screens of a column, move the cursor to its lowest position. Press the up arrow key until the cursor is in the position at which you want the bottom margin. Use the M command to establish the setting.

The P command facilitates the use of both the M and T commands. The P command prints the current values of the margin settings and the Tab key positions.

In emergencies, the BREAK key may be used to terminate *Ultralace*. However, the X command should be the standard means of exiting the program.

Good luck, and good publishing!


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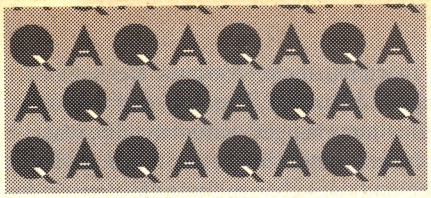



# Choose Your Charge

**by Marty Goodman**
**Contributing Editor**

*Q Can you tell me the pros and cons of using NiCad versus lead-acid batteries as the power supply for a custom CoCo 3 or other device?*

*Dennis McMillian (COCOKIWI)*
*Pittsburg, California*

A In most ways sealed lead-acid batteries are far superior for rechargeable-battery applications. Lead-acid batteries are easier to properly charge without overcharging.

Indeed, most low-to-medium-priced commercial NiCad battery chargers cook the NiCads if you leave them connected, and in time destroy the NiCad batteries. Lead-acid batteries usually take up less space for a given amount of stored power than NiCads, partly because they offer two volts per cell as compared to the 1.2 volts per cell of a NiCad battery. Thus, a 12-volt battery of lead-acid cells requires only six cells. But if you make the battery using NiCad cells, 10 cells are required. NiCad batteries have a slight weight advantage, but not nearly as much as most people think. The advantage tends to be only about 20 or 30 percent for the same amount of stored power compared to lead-acid cells, which is not significant in most applications. NiCad batteries have one major advantage over lead-acid batteries: They do not mind (indeed, they like) being fully discharged to near zero power. Lead-acid batteries, on the other hand, can be injured if totally discharged. NiCad batteries are known to suffer from *charge memory* — if NiCad batteries are repeatedly discharged to a given level then recharged back to full from that level, they refuse to discharge below that level. However, this charge-memory problem is encountered only if you cycle the batteries exactly to a given level of discharge and back to full many times. As a result it is encountered a lot less than many folks think.

More common with NiCads are problems of the batteries being cooked due to poor charging circuits, which results in the slow destruction of the battery. A proper charger for lead-acid batteries provides a regulated voltage of 2.3 volts per cell to "float" the battery (maintain a full charge level) and of 2.4 volts per cell to "quickly" (six to 12 hours) charge the battery. A proper NiCad battery charger both charges and floats the battery at 1.41 to 1.45 volts per cell. As a rule in charging either NiCad or lead-acid batteries, you should "float" the battery at 1/100 C, where C is the charge capacity of the battery measured in amp hours. Similarly, charge the battery at around 1/10 C. Of course, expensive and fancy quick chargers can charge batteries faster than that. But beware — unless your quick charger is very well-designed, there is grave danger of cooking the battery after it is charged. Even when the quick charger is well-designed, the very act of charging a battery at a higher current level than 1/10 C decreases its life. If you want to use sealed lead-acid batteries, I recommend Gates brand cells. They are hideously expensive, but of superlative quality. Also, Yasusa makes an excellent (and very economical) line of sealed lead-acid batteries.

There are two recent developments in the world of rechargeable batteries worth noting: New NiCad battery technology is about to double the amount of power that can be put into a given physical size battery. Sub-C NiCads typically are available in 1.2-amp-hour capacity, with some high-performance NiCads available with 1.7-amp-hour capacity. (2.4-amp-hour sub-C NiCads will soon be available.) Until recently, one big problem with lead-acid batteries was they were just not made in sizes smaller than D cells. This is no longer the case. Sony, in its newest cordless phones, is using a two-cell, 4-volt, 500-milliamp-hour capacity lead-acid battery that is physically about the size of two N cells. A replacement battery of this sort costs $18 retail from Sony at this time, but I am sure the price of such small lead-acid cells will be going down as they are more commonly used.

*Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG and database manager of OS-9 Online. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.*

### Things That Go Bump in the Night

*Q I have an OS-9-based CoCo 3 with a Multi-Pak, a disk controller and RS-232 Pak. The controller is in Slot 4 and the RS-232 Pak is in Slot 1. While the power was on the other day, I bumped the RS-232 Pak so that it was seated in its slot at an angle. I now get a blank screen when powering up the system. If I power up just the computer, or the computer with the empty Multi-Pak plugged in, I get a normal Extended BASIC message. Putting the RS-232 Pak into any slot before power up does not affect this. However, if I put my disk controller into any slot of the Multi-Pak, regardless of whether or not that slot is selected by the switch, the system refuses to power up and I get a blank screen when I turn the power on. I get the same effect if I use just the CoCo 3 with the*

*disk controller plugged directly into it. I read in your column that such an accident can damage the 6809 chip. So, I replaced my 6809 chip in the CoCo 3 (after socketting it), but the problem persists. What's going on? What can you recommend to fix things?*

*Richard Rae (RRAE)*
*Jackson, Mississippi*

A When you knock a plug-in card that is in a Multi-Pak, it often happens that the lands on the edge connector manage to short across two of the adjacent contacts on the female edge-connector socket of the CoCo or Multi-Pak. Now, in the Multi-Pak are sources of +12 and -12 volts on pins 1 and 2. Immediately adjacent to these pins are the Halt and NMI lines, respectively. It often happens that the -12-volt line is shorted to the Halt line, and the +12-volt line is shorted to the NMI line. This often results in the destruction of the 6809 chip, which is hooked directly to those lines.

The Halt and NMI lines also go to the disk controller, which generates Halt and NMI signals in the course of reading and writing sectors and tracks. Often the 12-volt surge on these lines wrecks the output buffers on the disk controller that supply those signals. On virtually all disk controllers, a 7416 or 7406 Hex open-collector gate inverter is used on the Halt and NMI lines. Most disk controllers use two of these chips, though usually only one of them is connected to the Halt and NMI lines. When these buffers get fried, they often die in the active-low direction of their outputs, causing a permanent Halt and/or NMI to be seen by the 6809. This is usually responsible for the freezing of the boot process when you turn the computer on with the disk controller plugged in.

Here's a quick test to see if my guess about what is going on is correct. Put slips of transparent "magic" (frosted) tape over the Halt and NMI lands on the 40-pin edge connector of the disk controller. These are pins 3 and 4, respectively, of the edge connector. Now (with the power off, of course), plug the controller into the CoCo 3 and turn the power on.

Does the CoCo 3 boot properly, giving you the Disk Extended Color BASIC sign-on message? If so, you've proven that a damaged Halt and/or NMI line is causing the problem. The cure usually involves merely replacing the fried 7416 or 7406 chip with a new 7406 chip. I urge you to replace a 7416, if your controller has one, with a 7406, which is an exact pin-for-pin equivalent chip, but is rated for higher voltage capacity. On rare occasions, this still does not cure the problem. You must then trace the Halt and NMI circuitry further back into the disk controller and possibly replace one or two more small scale logic chips that are involved with handling these signals. Of the last 10 disk controllers I have repaired, nine required replacing only the 7406 chip, but one required replacement of two other small-scale logic chips that fed the 7406 chip. By the way, don't feel bad about socketting and replacing the 6809 chip. Your 6809 likely was damaged by that surge of +12 and -12 volts on its Halt and NMI lines and might have caused you problems later on, even though it appeared to be working fine. Your 6809 is now socketted, allowing you to do any required similar repair in the future almost instantly.

### Where's the Memory

Q *I see ads for something called a 0K 512K upgrade. What are they talking about?*

*Cathy Mack (CATHYM)*
*Spokane, Washington*

A Upgrades to 512K are sold in two ways for the CoCo 3: With and without memory chips. You can buy a 512K upgrade with all 16 memory chips installed, and guaranteed by the seller to work. Or you can buy the upgrade board with empty


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sockets, allowing you to install your own set of sixteen 256K-by-1, 120-ns DRAM chips. These chips are generically called 41256 chips. They are usually available new from chip vendors for under $2 each. I have seen them selling for under 50 cents apiece from vendors of surplus, salvaged and desoldered chips.

The unpopulated 512K-upgrade board is referred to as a 0K board, telling you there are no memory chips — just empty sockets. The same terminology is used by vendors of PC-compatible equipment. Thus, a quoted price on a "286 mother board, 0K" implies you would be getting an 80286 mother board with no memory chips installed.

### Restoring Variables

**Q** *I am writing a BASIC application where I have broken the program down into smaller programs that load each other as needed. My problem is that my variables from one program disappear when I load another program. What can I do about this?*

*Tom Williams*
*Council Bluffs, Iowa*

**A** BASIC wipes out all old variables from a previous program when a new program is loaded. There are several ways around this problem. You can have your program poke information from one program into an unused area of memory. The next BASIC program you load can find the data there with a PEEK command. On a 512K CoCo 3, you can use the area between $00000 and $2F000 with the LPOKE and LPEEK commands. You can also have your program save its data values to disk for later access by the other program. An elegant solution involves using *Extended ADOS-3* and saving data to files on its RAM disk to allow quick saves and data retrieval.

### CM-1 and the CoCo

**Q** *I bought a Tandy 2000 system, including a CM-1 color monitor, as part of the close-out sale of all such "store" systems at a local Radio Shack. I was under the impression the CM-1 monitor was an EGA-type RGB monitor. Can I use the CM-1 with an EGA card in my IBM PC-compatible? Can I use the CM-1 with a Color Computer 3?*

*William T. Stamps*
*Clinton, Utah*

**A** The CM-1 is *not* an EGA-type monitor. Rather, it uses a unique, weird and generally worthless signal protocol. The CM-1 is properly classified as a 4-bit (RGBI) digital RGB monitor with separate HSync and VSync inputs that syncs at between 25- and 26-KHz horizontal-sync frequency. Note that IBM CGA monitors are 4-bit digital RGBI monitors that use separate sync, but sync at 15.75 KHz. EGA monitors are 6-bit (RrGgBb) digital RGB monitors that use separate HSync and VSync and sync at 21-KHz horizontal-sync frequency.

CoCo 3s provide separate HSync and VSync signals, with the horizontal-sync frequency at 15.75 KHz, and output analog-RGB signals. Due to the vast difference between the sync frequencies of the CM-1 and either CGA or CoCo 3 video, there is no way the CM-1 can be used with either. This also means that, unlike real EGA monitors, the CM-1 is incapable of switching its sync down to 15.75 KHz and emulating a CGA monitor.

The IBM EGA protocol is the closest of all standard protocols to that supported by the CM-1. However, the differences are extensive enough to make the CM-1 unsuitable for use with EGA. The sync frequency of the CM-1 (26 KHz) differs enough from EGA sync frequency so that it cannot sync to an EGA signal, even if you get the polarity of the HSync and VSync correct. It may be possible, by messing with the Horizontal Hold control (VR502 in the CM-1) and/or with R506 (a 12K resistor in series with VR502) that you can shift the range of sync of the CM-1 down enough so that it will sync to the EGA sync frequency of 21 KHz. Note that switches 3 and 4 of the 4-switch DIP switch block S601 deep inside the CM-1 monitor on the motherboard control the required polarity of the incoming vertical and horizontal sync signals, respectively. You may need to adjust them, too. Even if you get the CM-1 to sync to EGA frequencies, the best you can do without further hacking is get a total of six colors plus black and white out of it. The CM-1 does not support secondary red, green and blue signals of the EGA protocol and you want to leave the intensity line input of the CM-1 disconnected. Thus, you'd lose most of the color capability that goes with EGA. *If* you get the CM-1 to sync to the EGA signal, in theory you could wire a little circuit using two or three TTL logic chips or one PAL chip that converts 6-bit EGA RGB into 4-bit CM-1 RGB and get an extra seven colors out of the signal. Even then you'd be getting only 14 colors plus black and white, not the roughly 60 colors available with EGA. This is hardly worth the work. If you really want to try such things, be sure to order a service manual for the CM-1 from Tandy National Parts. The cost is around $8, including shipping.

I have a couple of CM-1s and use one on my generic PC/XT. The way I accomplished this was through a special monitor card made by Tandy (Cat. #26-3047), but discontinued long ago. You can hook the CM-1 to it and use the monitor as if it were a CGA monitor, with one important exception: On all 80-by-25 text screens, the characters are drawn with EGA, not CGA quality and resolution. All software used with this setup will recognize it as a CGA system and all graphics will be CGA-type graphics. My text screen with this system is quite decent and far superior to that of a real CGA monitor and card.

If you are lucky enough to lay hands on a Tandy 26-4037 video card, you may be able to get EGA-like graphics capability out of your CM-1. Even if this works to achieve EGA graphics resolution (640-by-350), you still cannot get more than 14 colors, plus black and white, out of the CM-1. I have not been able to get a 26-4037 video card and cannot speak about this from experience. If anyone wants to offer one to me, I might be interested, if the price is right. Finally, note very carefully that, by some odd coincidence, the Tandy catalog numbers for these two video cards are awfully similar. The CGA-only card is number 26-3047 and the EGA/CGA card is 26-4037. Don't confuse them!

### CoCo 2 Won't Drive the Disk

**Q** *I have a CoCo 2 that works fine with the tape recorder, but does not work with a disk controller. Does this mean the 6809 is bad?*

*Ray Reynolds*
*Pipestone, Minnesota*

**A** Probably. A defective 6809 is usually the problem in situations where a CoCo works with Extended BASIC but refuses to work with the disk controller. Of course you must be sure the disk controller is good by testing it with another CoCo 2 or 3. After that, try replacing the 6809 to see if that solves the problem. Note that CoCo 1s and 2s are quite happy using not only the old 1-MHz rated 6809E, but also the newer and faster 68A09E and 68B09E chips (although you'll see no speed gain).

### Game ROMs in the Disk Controller

**Q** *Can I put the chip from* Tetris *into a spare socket on my Disto Super Controller with four sockets and get the game to work?*

*Tom Lucas (TOMLUCAS)*
*La Grange, Illinois*

**A** You should be able to do this if the chip in the ROM pak is a DIP-style chip. Note that some of the Tandy ROM paks used COBBS technology — the silicon chips are bonded directly to the circuit board. You cannot remove such chips without destroying them. Frankly, though, I think you

are taking the wrong approch to the problem. This is one case where using software is far superior to a hardware approach. *Tetris* is relatively easy to run as a disk-based program — it is not copy-protected. You merely transfer the cartridge information to RAM and add a loader program to put it into high RAM after execution. You may have to alter one or two bytes of a block-move program it uses to make sure the computer never is put into ROM/RAM mode. Just look for occurrances of stores to $FFDE and change them to stores to $FFDF.

Finally, note that Eversoft sells a floppy-disk-based version of the game called *Soviet Block*. I have played both the Tandy and Eversoft versions, and I am convinced the Eversoft version is significantly superior. Their version is not only more colorful, but it allows better control of the game.

### Using the CoCo PRO! RS-232 Pack

**Q** *Will the CoCo PRO! RS-232 pack or a DC Modem Pak modified by me using CoCo PRO!' s modification kit or the article in THE RAINBOW work properly with any modem? Will I need to make a custom cable to connect it to my modem?*

*Robert E. Strack*
*Covina, California*

**A** The devices you refer to (which I designed) should work with most modems. They certainly work fine with ordinary Hayes-compatible modems using straight-through DB-25 cables. Since the 6551 chip in the Modem Pak does not receive data unless it sees a valid carrier detect, you may want to set a switch in your modem or arrange for a custom cable to force carrier detect to the pack High. This will allow you to see what you type when using a Hayes modem offline in the Command mode. To make such a custom cable, connect pins 2, 3, 7, and 20 on both connectors together through four separate wires. Then short Pin 8 to Pin 20 on the connector that plugs into the CoCo PRO! pack. This kind of cable might benefit users of Tandy RS-232 Paks, too.

Some earlier modems also require that Pin 4 (RTS) coming to them be High before they will transmit data over the phone line. For such modems, you should not only connect Pin 20 between the CoCo PRO! pack and the modem, but also short Pin 20 to Pin 4 on the connector going to the modem. This is not a problem for users or Tandy RS-232 Paks because those do support the RTS line. The CoCo PRO! pack does not.

Because MNP-equipped modems like to use the RTS and CTS lines, which are not supported by the CoCo PRO! pack, for handshaking, users of such modems may have a problem fully using the MNP protocol. MNP is of limited value to Color Computer users. However, those using MNP should tell the MNP protocol to use XON/XOFF for flow control, not CTS/RTS, and to disable flow control when transferring files. This should solve any problems involving use of the CoCo PRO! pack with an MNP modem.

**Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P.O. Box 385, Prospect, KY 40059.**

**We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.**

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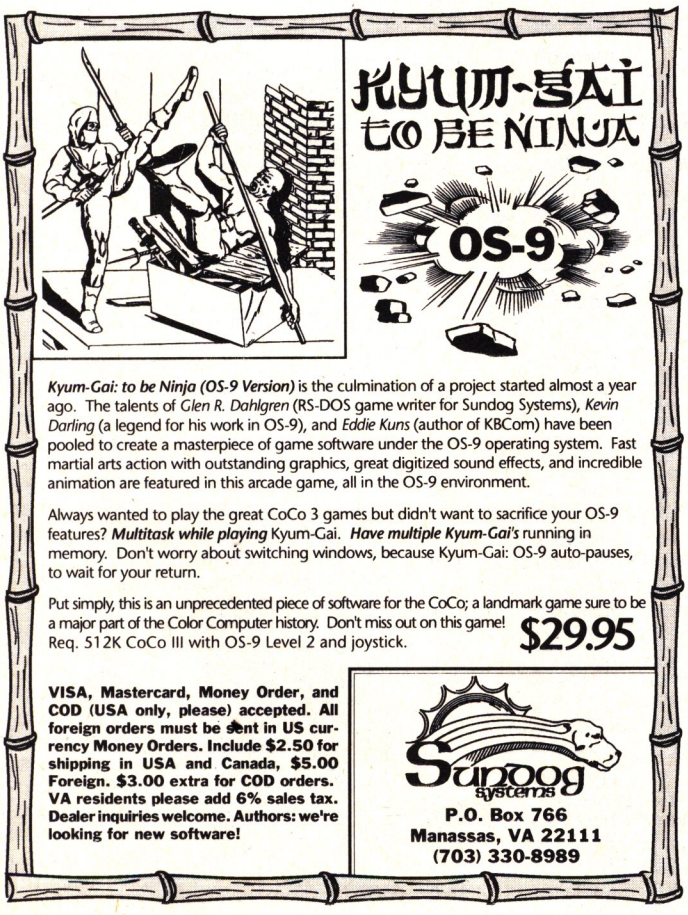


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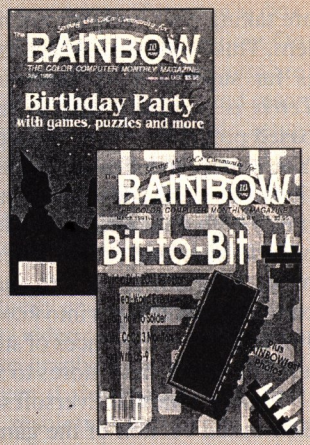


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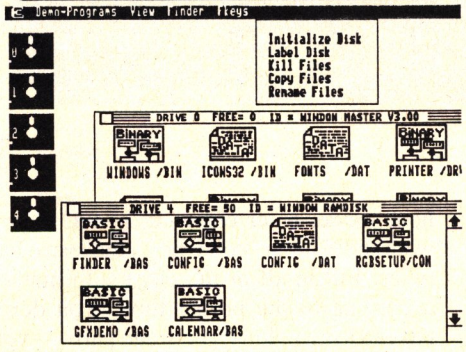


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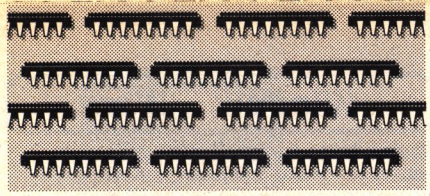
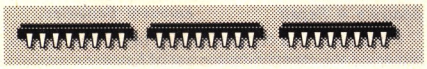




# It's About Time

**by Tony DiStefano**
**Contributing Editor**

Over the last two installments of "Turn of the Screw," we've covered construction of a real-time clock. In the first part of this project I gave a detailed description of the OKI MSM6242 clock chip. In part two of this series I showed you how to wire this clock chip to make a real-time clock (RTC) for your CoCo. Your clock circuit should now be assembled, tested and ready to go. Now it's time to make it tick, so to speak.



The software for our real-time clock comes in two parts. The first part is a BASIC program that is used to set the clock. This software initializes all of the clock's registers and properly sets the time, according to the program setting. The second part is a machine-language program that can be used to integrate the real time into your BASIC programs. This program can display the time continuously or store it into a string that you can pull apart and use for your real-time application.

Enter Listing 1 and save it as SETM. When you run this program for the first time you will see random numbers on the screen, which is normal. Under the first line of numbers you will see how the real time is formatted. Now, press the space bar until you are under the first X. If you want the 12-hour mode, enter either AM or PM. If you want the 24-hour mode, press the space bar twice. Fill in all of the other information according to the proper time. You don't have to use a colon (:) between parts — you can use a space instead. After you enter all of the data, press ENTER. Run the program again to make sure the clock has the correct time. The top line should now show the proper time. If the proper time is not shown, enter it again.

Enter Listing 2 and save it as CLKGEN. When you run this program, it saves a file called CLOCK on disk. If you do not have a disk drive, change the line that reads SAVEM to CSAVEM (Line 150), which routes the file to cassette. (Are there any people still running on cassette?) Now, in theory, you no longer need the CLKGEN program, but keep it just in case you do. (You don't want to enter it again do you?) The CLOCK program is a machine-language driver to run the clock. After you LOADM it, enter EXEC. If you have to load other machine-language drivers, you must remember where the driver is located in memory, and execute the right address. By default, this driver loads at $0E00. Therefore, to get the time you must

32K Disk

**Listing 1:** SETM

```
10 GOTO50 : 'PROGRAM TO SET THE
CLOCK FOR THE RAINBOW TURN OF TH
E SCREW TIME PROJECT V2.0
20 GOSUB60:A$=STR$(A):A$=RIGHT$(
A$,LEN(A$)-1):IFLEN(A$)<2THENA$=
"0"+A$
30 PRINTA$;:RETURN
40 IFP>LEN(A$)THEN820 ELSERETURN
50 A$(0)="SUN":A$(1)="MON":A$(2)
="TUE":A$(3)="WED":A$(4)="THU":A
$(5)="FRI":A$(6)="SAT":GOTO80
60 RETURN
70 RETURN
80 CLS:X=&HFF50: POKEX+1,13:POKE
X,0:POKEX+1,15:POKEX,0:PRINT
90 PRINT"TIME>  ";
100 POKE&HFF03,PEEK(&HFF03)AND&H
FE
110 GOSUB60
120 POKEX+1,15:A=PEEK(X)AND15
130 IF(A AND4)THENPRINT"   ";:PO
KEX+1,5:A=PEEK(X)AND15:GOTO150
140 GOSUB60:POKEX+1,5:A=PEEK(X)A
ND15:IF(A AND4)THENPRINT"PM ";EL
SEPRINT"AM ";
150 POKEX+1,4:A=10*(A AND3)+(PEE
K(X)AND15)
160 GOSUB20
170 PRINT":";
180 POKEX+1,3:A=PEEK(X)AND15:POK
EX+1,2:A=A*10+(15ANDPEEK(X))
190 GOSUB20
200 PRINT":";
210 POKEX+1,1:A=PEEK(X)AND15:POK
EX+1,0:A=A*10+(15ANDPEEK(X))
220 GOSUB20
230 PRINT" ";
240 POKEX+1,12:PRINTA$(PEEK(X)AN
D7);" ";
250 POKEX+1,7:A=10*(PEEK(X)AND15
):POKEX+1,6:A=A+(PEEK(X)AND15)
260 GOSUB20:PRINT"/";
270 POKEX+1,9:A=10*(PEEK(X)AND15
):POKEX+1,8:A=A+(PEEK(X)AND15)
280 GOSUB20:PRINT"/";
290 POKEX+1,11:A=10*(PEEK(X)AND1
5):POKEX+1,10:A=A+(PEEK(X)AND15)
300 GOSUB20:PRINT:GOSUB910
310 POKE&HFF03,PEEK(&HFF03)OR1
320 LINEINPUT" SET:  ";A$
330 POKE&HFF03,PEEK(&HFF03)AND&H
FE
```

*Tony DiStefano is a well-known early specialist in computer hardware projects. He lives in Laval Ouest, Quebec. Tony's username on Delphi is DISTO.*

enter EXEC&HOE00. This also works from within a BASIC program as follows:

```
1000 EXEC &HOE00
```

The time is shown at the current position of the cursor.

The CLOCK program has three functions. One function is that it shows the present time onscreen. Another function of CLOCK is the permanent onscreen display of the time. To use this function enter EXEC:ON, which displays the real time. The time reappears even after a screen scroll. To end this function enter EXEC:OFF. Again, if you load other drivers you must specify the clock driver's address. For example, enter EXEC&HOE00:OFF.

The remaining function gives you the ability to save the current time in a string. The command for this function is EXEC:A$. Variable A$ receives the contents of the clock at the time the command is issued. You can then print A$ where you want or get parts using MID$, whichever suits your needs.

By default the driver loads into memory from $0E00 to $1025. This driver is completely relocatable, so you can load it with an offset to anywhere in memory. Remember though, you must keep track of its location to use it. Also, if you are using graphics and a long BASIC program, you must protect CLOCK from being overwritten. Your BASIC manual instructs you on this procedure. Enjoy your time!

❑

```
340 P=1
350 GOSUB60
360 GOSUB40
370 IFLEFT$(A$,2)="AM"THENM1=1
380 IFLEFT$(A$,2)="PM"THENM1=2
390 GOSUB60:POKEX+1,15:B=PEEK(X)
 OR1:POKEX,B:IF M1=0 THEN B=B OR
 4 ELSE B=B AND 11
400 POKEX,B:B=B AND 14:POKEX,B:P
OKEX+1,5:B=PEEK(X)AND3:IFM1=2THE
NB=B OR4
410 GOSUB60:POKEX+1,5:POKEX,B
420 GOSUB40
430 P=P+4
440 GOSUB40
450 GOSUB60:POKEX+1,5:A=PEEK(X)A
ND15
460 IFMID$(A$,P-1,2)<>"  "THENA=
A AND12
470 A=A OR(VAL(MID$(A$,P-1,1)))
480 GOSUB60:POKEX+1,5:POKEX,A
490 IFMID$(A$,P,1)<>" "THENGOSUB
60:POKEX+1,4:POKEX,VAL(MID$(A$,P
,1))
500 P=P+3
510 GOSUB40
```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```
520 IFMID$(A$,P-1,2)="  "THEN550
530 GOSUB60:POKEX+1,3:POKEX,VAL(
MID$(A$,P-1,1))
540 GOSUB60:POKEX+1,2:POKEX,VAL(
MID$(A$,P,1))
550 P=P+3
560 GOSUB40
570 IFMID$(A$,P-1,2)<>"00"THEN59
0
580 GOSUB60:POKEX+1,1:POKEX,0:GO
SUB60:POKEX+1,0:POKEX,0
590 P=P+4
600 GOSUB40
610 B$=MID$(A$,P-2,3)
620 IFB$="   "THEN670
630 FORA=0TO6
640 IFB$=A$(A)THEN660
650 NEXTA:GOTO670
660 GOSUB60:POKEX+1,12:POKEX,A
670 P=P+3
680 GOSUB40
690 IFMID$(A$,P-1,2)="  "THEN720
700 GOSUB60:POKEX+1,6:POKEX,ASC(
MID$(A$,P,1))
710 GOSUB60:POKEX+1,7:POKEX,ASC(
MID$(A$,P-1,1))
720 P=P+3
730 GOSUB40
740 IFMID$(A$,P-1,2)="  "THEN770
750 GOSUB60:POKEX+1,8:POKEX,ASC(
MID$(A$,P,1))
760 GOSUB60:POKEX+1,9:POKEX,ASC(
MID$(A$,P-1,1))
770 P=P+3
780 GOSUB40
790 IFMID$(A$,P-1,2)="  "THEN820
800 GOSUB60:POKEX+1,10:POKEX,ASC
(MID$(A$,P,1))
810 GOSUB60:POKEX+1,11:POKEX,ASC
(MID$(A$,P-1,1))
820 'CHECK FOR EVERY 4TH YEAR
830 '
840 ' (Y/4=INT(Y/4))
850 GOSUB60:POKEX+1,9:A=PEEK(X)A
ND15:GOSUB60:POKEX+1,8:A=A*10+(P
EEK(X)AND15):IFA>2THENA=0:GOTO89
0
860 GOSUB60:GOSUB60:POKEX+1,10:A
=PEEK(X)AND15
870 GOSUB60:POKEX+1,11:A=A*10+(P
EEK(X)AND15)
880 IF(A/4)=INT(A/4) THENA=4 ELS
EA=0
890 GOSUB60:POKEX+1,7:B=PEEK(X)A
ND3:B=B ORA:POKEX,B
900 POKE&HFF03,PEEK(&HFF03)OR1:E
ND
910 PRINT"       XX HH:MM:SS DAY
 DD/MO/YY":RETURN
920 '
930 '
940 '         S E T
950 '           B Y
960 '      D A N I E L
970 '  C H O U I N A R D
980 '       <C> 1985
990 '============================
1000 '
1010 ' MODIFIED BY TONY DISTEFAN
O
1020 ' FOR THE MSM6242 CLOCK
1030 ' VERSION 2.0 NOV 3 1988
1040 ' REPRINTED BY PERMISION
```

**Listing 2:** CLKGEN

```
1 ' GENCLK
10 ' PROGRAM TO GENERATE THE
20 ' CLOCK DRIVER
30 ' BY TONY DISTEFANO FOR
40 ' TURN OF THE SCREW
50 ' DRIVER PROGRAM BY
60 ' DANIEL CHOUINARD
90 CLEAR 300
100 FOR I = &HE00 TO &H1025
110 READ A$
120 X = VAL("&H"+A$)
130 POKE I,X
140 NEXT I
150 SAVEM"CLOCK/BIN",&HE00,&H102
5,&HE00
160 END
1000 DATA 9D, 9F, 4D, 27, 29, 81
, 88, 27, 2A, 81
1010 DATA AA, 27, 40, C6, 18, BD
, B5, 6D, 34, 10
1020 DATA BD, B3, 57, 1F, 12, D,
 6, 10, 27, 1
1030 DATA C4, 35, 10, 34, 30, 8D
, 42, 35, 30, AF
1040 DATA 22, C6, 18, E7, A4, 39
, 8E, 0, 0, 20
1050 DATA 34, 30, 8D, 1, B1, 34,
 10, 10, BE, 1
1060 DATA D, 10, AC, E1, 27, A,
BF, 1, D, 10
1070 DATA AF, 8D, 1, AE, 9D, 9F,
 39, AE, 8D, 1
1080 DATA A7, BF, 1, D, 9D, 9F,
B6, E0, 3D, 84
1090 DATA DF, B7, E0, 3D, B6, E0
, 46, 84, DF, B7
1100 DATA E0, 46, 39, 34, 37, 1A
, 50, 86, FF, 10
1110 DATA 8E, FF, 50, C6, D, E7,
 21, E6, A4, CA
1120 DATA 1, E7, A4, 12, E6, A4,
 C5, 2, 27, 18
1130 DATA C4, FE, E7, A4, 4A, 27
, 2, 20, EA, 31
1140 DATA 8D, 1, 88, A6, A0, 10,
 27, 0, A5, 17
1150 DATA 0, B0, 20, F5, C6, F,
E7, 21, E6, A4
1160 DATA C5, 4, 27, A, 86, 20,
17, 0, 9F, 17
1170 DATA 0, 9C, 20, 18, C6, 5,
E7, 21, E6, A4
1180 DATA C5, 4, 26, 4, 86, 41,
20, 2, 86, 50
1190 DATA 17, 0, 87, 86, 4D, 17,
 0, 82, 86, 20
1200 DATA 17, 0, 7D, C6, 5, E7,
21, A6, A4, 84
1210 DATA 3, 8B, 30, 17, 0, 70,
C6, 4, 8D, 60
1220 DATA 86, 3A, 8D, 68, 8D, 5A
, 8D, 58, 86, 3A
1230 DATA 8D, 60, 8D, 52, 8D, 50
, 86, 20, 8D, 58
1240 DATA C6, C, E7, 21, E6, A4,
 C4, 7, 86, 3
1250 DATA 3D, 34, 10, 30, 8D, 1,
 1, 3A, 1F, 13
1260 DATA 35, 10, A6, C0, 8D, 3E
, A6, C0, 8D, 3A
1270 DATA A6, C4, 8D, 36, 86, 20
, 8D, 32, C6, 7
1280 DATA 8D, 22, 8D, 20, 86, 2F
, 8D, 28, C6, 9
1290 DATA 8D, 18, 8D, 16, 86, 2F
, 8D, 1E, C6, B
1300 DATA 8D, E, 8D, C, C6, D, E
7, 21, E6, A4
1310 DATA C4, FE, E7, A4, 35, B7
, E7, 21, A6, A4
1320 DATA 84, F, 8B, 30, 8D, 2,
5A, 39, 8C, 0
1330 DATA 0, 27, 8, 8C, 5, FF, 2
5, B, A7, 80
1340 DATA 39, 34, 36, AD, 9F, A0
, 2, 35, B6, 34
1350 DATA 2, 81, 40, 25, 6, 81,
60, 25, 4, 84
1360 DATA DF, 88, 40, A7, 80, 35
, 2, 34, 36, D
1370 DATA E7, 26, 2, 35, B6, B7,
 DF, FF, B6, E0
1380 DATA 3D, 8A, 20, B7, E0, 3D
, B6, E0, 46, 8A
1390 DATA 20, B7, E0, 46, B6, FF
, A1, 34, 3, 1A
1400 DATA 50, 86, 36, B7, FF, A1
, 8C, 4, 9, 26
1410 DATA 13, 8D, 35, 34, 10, 86
, 20, E6, 3F, 8E
1420 DATA 0, 50, ED, A1, 30, 1F,
 26, FA, 35, 10
1430 DATA 1F, 10, 83, 4, 9, 58,
49, 8D, 1B, 34
1440 DATA 20, E3, E1, 1F, 1, D6,
 E7, 58, 86, 28
1450 DATA 3D, C0, 32, 3A, B6, DF
, FF, A7, 84, 35
1460 DATA 3, B7, FF, A1, 20, A3,
 34, 2, 10, 8E
1470 DATA 27, 80, 96, E7, 4A, 27
, 4, 10, 8E, 2F
1480 DATA 0, 35, 82, C6, 18, 7E,
 AC, 46, 7F, FF
1490 DATA 51, B6, FF, 50, 84, F,
 8B, 70, B1, 4
1500 DATA 12, 26, 3, 7E, D7, BC,
 8E, 4, 8, 17
1510 DATA FE, 67, 20, F5, 53, 55
, 4E, 4D, 4F, 4E
1520 DATA 54, 55, 45, 57, 45, 44
, 54, 48, 55, 46
1530 DATA 52, 49, 53, 41, 54, 4E
, 4F, 20, 43, 4C
1540 DATA 4F, 43, 4B, 20, 46, 4F
, 55, 4E, 44, 0
```

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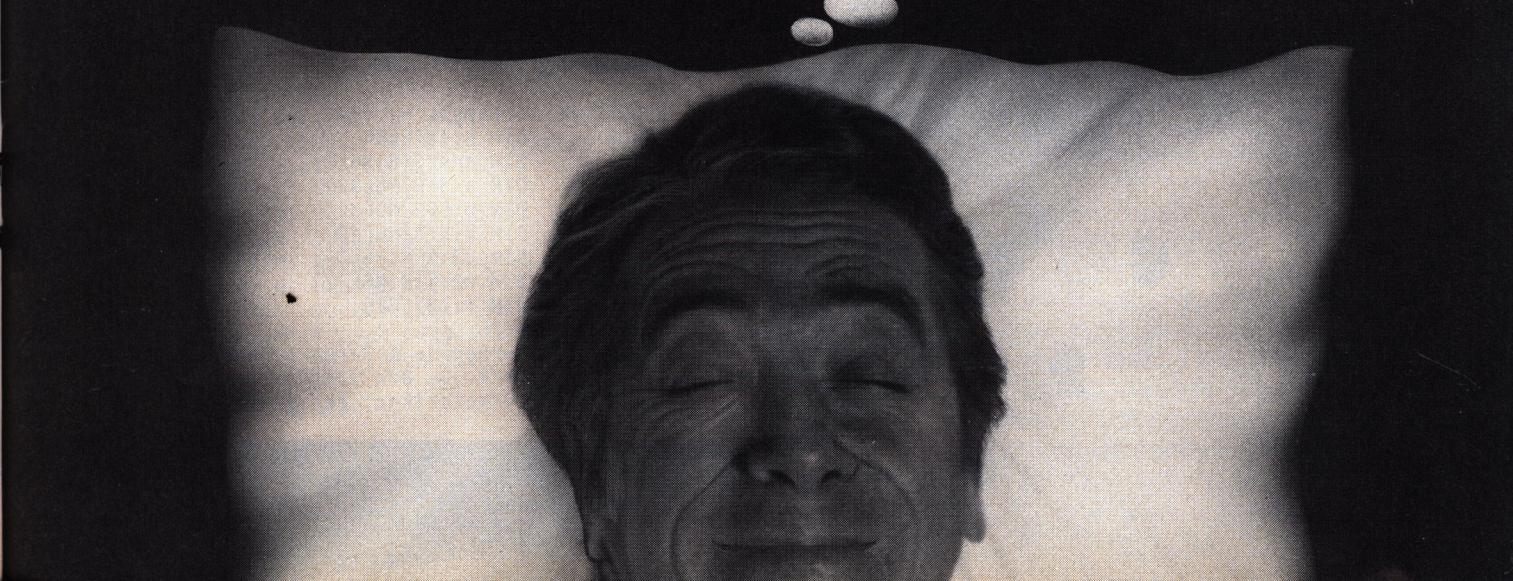


*An easy-to-use address label maker for BASIC09*

# Addressed to You

by Bernie E. Besherse

Since I bought a hard drive for my CoCo, I've switched almost exclusively to OS-9. This has left me looking for ways to rewrite my favorite utilities for BASIC09. Since BASIC09 is fairly different from Extended BASIC (it uses stricter syntax and has special requirements), this has been quite a struggle for me. For example, while I was writing *Address Label*, the program looked as though it should run. But all it gave me was an Excedrin headache. That is, until I added an appropriate `DIM` statement for `ppath` at Offset 0022 in the `PrintLabel` procedure. After that, it worked perfectly. I simply hadn't realized BASIC09 requires

---

*Bernie Besherse is a Merchant Marine staff officer who works on Alaska's Marine Highway. He enjoys "messing around" with boats and computers. Bernie has contributed many articles to a Pacific-Northwest OS-9 newsletter. He can be contacted at P.O. Box 9381, Ketchikan, AK 99901, (907) 225-1324. Please include an SASE when requesting a reply.*

OS-9

**The Listing:** `AdrLabel.b09`

```
PROCEDURE AdrLabel
 0000       DIM n:INTEGER
 0007       DIM ans:STRING[1]
 0013       DIM a:STRING[32]
 001F       DIM b:STRING[32]
 002B       DIM c:STRING[40]
 0037       DIM c1:STRING[32]
 0043       DIM c2:STRING[32]
 004F       DIM l:INTEGER
 0056       n=25
 005D       a="Bernie & Barbara Besherse"
 007D       b="P. O. Box 9381"
 0092       c="Ketchikan, AK  99901"
```

```
00AD      PRINT CHR$(12)
00B2 10   PRINT " This program will print "; n; " Adress Labels for:"
00EC      PRINT
00EE      PRINT "           "; a
0100      PRINT "           "; b
0112      PRINT "           "; c
0124      PRINT
0126      PRINT "  If you want "; n; " of these, hit       Y."
0156      PRINT
0158      PRINT "  If you want to change the name hit      D."
0188      PRINT "  If you want a new Address hit           E."
01B8      PRINT "  For a new City, State, or Zip use       F."
01E8      PRINT "  If you want More or Less labels hit     G."
0218      PRINT
021A      PRINT "      You can always hit   Q   to quit."
0245      PRINT
0247      INPUT "                                  Select one ",ans
0279      IF ans="Y" OR ans="y" THEN
028E        RUN printlabel(n,a,b,c)
02A7        INPUT " Do you want some more?",ans
02C6        IF ans="Y" OR ans="y" THEN
02DB          RUN adrlabel
02DF        ELSE END
02E4        ENDIF
02E6      ENDIF
02E8      IF ans="D" OR ans="d" THEN
02FD        INPUT " New name?  :",a
0312        PRINT CHR$(12)
0317        GOTO 10
031B      ENDIF
031D      IF ans="E" OR ans="e" THEN
0332        INPUT "  New address? :",b
034A        PRINT CHR$(12)
034F        GOTO 10
0353      ENDIF
0355      IF ans="F" OR ans="f" THEN
036A        INPUT "  Enter New City      :",c1
0389        INPUT "  Enter State and ZIP :",c2
03A8        c:=c1+", "+c2
03B9        PRINT CHR$(12)
03BE        GOTO 10
03C2      ENDIF
03C4      IF ans="G" OR ans="g" THEN
03D9        INPUT "  How many labels do you want?  :",n
0402        PRINT CHR$(12)
0407        GOTO 10
040B      ENDIF
040D      IF ans="Q" OR ans="q" THEN END
0423      ENDIF

PROCEDURE printlabel
0000      PARAM n:INTEGER
0007      PARAM a,b,c:STRING[32]
001B      DIM label:INTEGER
0022      DIM ppath:BYTE
0029      PRINT CHR$(12)
002E      PRINT " Now printing "; n; " labels for:"
0053      PRINT
0055      PRINT "           "; a
0067      PRINT "           "; b
0079      PRINT "           "; c
008B      PRINT
008D      PRINT
008F      OPEN #ppath,"/p":WRITE
009C      PRINT #ppath,CHR$(27); CHR$(69);
00AB      FOR label=1 TO n
00BC        PRINT CHR$(7);
00C2        PRINT USING "I4>",label;
00CF        PRINT #ppath,a
00D9        PRINT #ppath,b
00E3        PRINT #ppath,c
00ED        PRINT #ppath,CHR$(13)
00F7        PRINT #ppath,CHR$(13)
0101        PRINT #ppath,CHR$(13)
010B      NEXT label
0116      CLOSE #ppath
011C      END
```

DIM statements for a lot of things Extended BASIC doesn't.

*Address Label* is a single-row, label-printing utility that is designed to work with the Brother M-1109 printer. If the printer you use doesn't accept the codes, check your printer manual for the proper control codes, then change the CHR$(*xx*) statements as needed. The codes are as follows:

| Offset | Code | Brother Function |
|---|---|---|
| 009C | 27,69 | starts bold print |
| 00BC | 7 | ring bell |
| 00ED | 13 | carriage return |
| 00F7 | 13 | carriage return |
| 0101 | 13 | carriage return |

I usually set my printer to NLQ manually before running *Address Label*. You can replace the middle line of the carriage returns with a line to print your phone, Delphi username, or whatever else you may want.

To enter and use *Address Label*, you must have basic09 and runb in the CMDS directory. Call BASIC09 by entering basic09 #15k. This starts BASIC09 and requests 15K for your program. To get into BASIC09's editor, enter

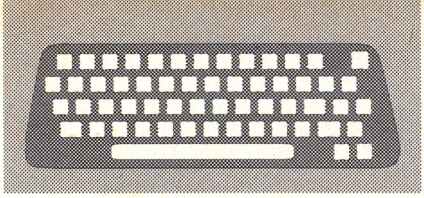
```
edit AdrLabel  or  e AdrLabel
```

When using BASIC09's editor to enter lines from the program listing, you must press the space bar on each line, prior to entering any other characters for that line. The first character used in a line in the editor is interpreted as a command. The space command tells the editor to accept the text that follows it. If you use a different text editor to enter the listing, *do not* use a space at the beginning of each line. Enter both procedures (AdrLabel and PrintLabel) and save them to disk. (Save AdrLabel as AdrLabel.proc so the source is not overwritten when we save the combined source code.) Then, with both procedures in memory, enter the following commands:

```
save* AdrLabel
pack* AdrLabel
```

The first command saves both AdrLabel and PrintLabel in one combined source-code file in the current working directory. The second command saves an executeable version of the procedures to the current execution directory, which should be CMDS. As long as runb is in the execution directory, you should be able to run the executable version of *Address Label* by entering adrlabel at the OS9: prompt.

Experiment with *Address Label*. You, too, will find OS-9 and BASIC09 aren't that difficult to use. If you have problems with the program, call or write me.





# Patching Dynacalc

THE RAINBOW Staff

? *I recently purchased* Dynacalc, *and I have a problem with it. Although I've used* xmode *to set the printer spacing for single spacing, output from the program is still double-spaced. I hate to have to change the DIP switch settings on the back of the printer to achieve this. I was browsing through back issues of THE RAINBOW and came across a letter in the September 1988 issue that addresses this problem. In your response, you listed four values that need to be changed. I just haven't quite figured out how to use* debug *or* modpatch *to make the change. Can you help?*

*Dale Phillips*
*Schroon Lake, New York*

a Sure. To eliminate the extra linefeed supplied by *Dynacalc*, the values found at the following offsets must be changed as shown:

| Offset | Old Value | New Value |
|---|---|---|
| 7 | 80 | 81 |
| 8 | 63 | 62 |
| 4BE2 | 26 | 20 |

The September 1988 letter to the editor indicated four changes. The last change, to Offset 5215, is intended to update the CRC. We'll let modpatch do this for us.

Unfortunately modpatch is not documented in the OS-9 Level II manual even though the command comes with the package. To get the documentation for it, you must have the *Development System*. However, you can use the help command to get some information about modpatch. Just enter help modpatch. The commands we need to use are L, C and V, which *link* a module, *change* a byte and *verify* (update CRC), respectively.

There are a few things you need to know about modpatch. First, it is designed to work on modules (programs) in memory, so you'll have to load *Dynacalc* before doing anything. Second, modpatch does not resave the modified file. But we can get around that. Finally, it can accept changes entered from the keyboard (standard input) or routed from a text file (redirected input). We'll use a text file for this modification.

To create the patch file, we'll use the build command. Enter

```
build dcfix
```

at the OS-9 prompt. For each line of text you enter, you'll be prompted with a question mark. Type the following lines, pressing ENTER after each:

```
L dynacalc
C 7 80 81
C 8 63 62
C 4BE2 26 20
V
```

After entering these lines, press ENTER once more at the remaining ? prompt and build saves the text file to disk with the name dcfix.

We are now ready to patch the dynacalc file. First load the file into memory by entering

```
load /dd/cmds/dynacalc
```

After the program is loaded, it is considered a module and modpatch can work with it. Make the patches by entering

```
modpatch <dcfix
```

The < symbol tells modpatch to get its input from the file we created earlier. At this point, you can run *Dynacalc* by simply entering its name. The patched version will execute from memory.

If you don't have the OS-9 save command, which also comes with the *Development System*, you'll have to load *Dynacalc* and patch it with modpatch every time you run it. If you do have save, save the module back to your CMDS directory. The patches are saved with it.

Because you didn't tell us what system configuration you have (floppy drives, hard drive, etc.), we were not able to provide specific directions regarding the directories and disks you might be using. We assume you have some familiarity with OS-9's directory structure. If you are using a backup of the *Dynacalc* distribution disk, copy modpatch to the CMDS directory on that disk. Also, we recommend you store dcfix in the same directory in which dynacalc.trm is located. Change to that directory before loading, patching and running dynacalc.

### OS-9 at a Distance

? *How can I connect my CoCo 3 to another CoCo 2 or CoCo 3 under OS-9? What hardware and software is required, and how do* tsmon *and* login *figure in? What are the limitations of such a setup (i.e. speed, file-locking, etc.)?*

*Frank Randle*
*Kenosha, Wisconsin*

a In such a situation, one computer acts as a *host*, while the other acts as a *terminal*. The host is the main computer, where the files and programs are stored. The terminal must log onto the host before it has access to these files.

As far as hardware goes, you'll need a null-modem cable to go between the serial ports of the host and terminal computers.

Since speed and reliability are important, you'll want to operate at 9600 or 19,200 bps. This requires an RS-232 Pak or similar ACIA interface on both the host and terminal units. Hook the null-modem cable between these interfaces.

Now for the software; we aren't clear from your letter whether you want the host running Level II or Level I. However, because the limitations under Level I make it fairly unfeasible, we'll assume you do want your host running Level II.

On the host computer, you need the Level II versions of `tsmon` and `login` in the `CMDS` directory. These were marketed as part of the *Development System* from Tandy. You can try Tandy's Express Order System at (800) 321-3133, but we're not sure if they have that package now. Several versions of `tsmon` can be found in the Telcom section of the database on Delphi. In addition, there is a group called `LOGIN.FIX` in the Patches topic. This is a `modpatch` file that fixes the Level I `login` command for use with Level II. The timesharing monitor, `tsmon`, watches selected serial ports and runs `login` when it detects activity. The `login` utility verifies the user's name and password with a file called `password` located in the `SYS` directory, and it prints a message of the day (`motd`, also found in the `SYS` directory) on the user's terminal. The password file is not included with Level II, but you can copy it from the Level I disk when you get `login`.

For the terminal computer, you need only a basic terminal program. However, it should support the RS-232 as mentioned above, and you may want certain features. The terminal program you use can be written for either OS-9 or Disk BASIC.

Once you are ready, activate `tsmon` by entering

```
tsmon /t2&
```

at the OS-9 prompt. The ampersand (&) tells OS-9 to run `tsmon` in the background so you can continue to use the host. If you want the terminal user to be the only active user, leave the ampersand off — just make sure you leave an "out," such as a second window, for the host.

To log on from the terminal, just press ENTER. `tsmon` will run `login` and you're in. To log off, just press CTRL-BREAK.

A limiting factor is speed, which is affected by transmission rate and user/process priority. If two people use the system at the same time, memory could be a problem depending on what each user is doing. OS-9 Level II provides complete, automatic file- and record-locking capabilities, but OS-9 Level I does not. We haven't covered all the ins and outs here, but have presented enough to get you going. Good luck, and welcome to the world of multiuser systems.

### True Lowercase

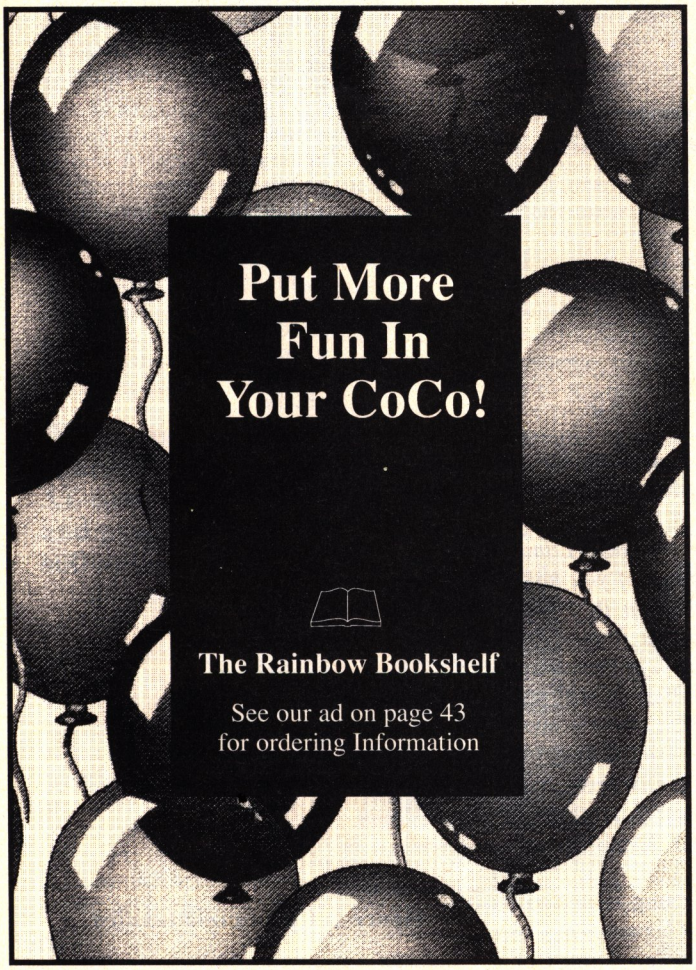
?

*In the May 1991 issue of THE RAINBOW, Mr. James Gerrie of Huntsville, Ontario is looking for a way to use the true lowercase capabilities of his CoCo 2 under OS-9. The BASIC09 program in Listing 1 will put a command called* `tlcase` *in the* `CMDS` *directory of Drive* `/d0`*. The assembly-language source is shown in Listing 2. The* `tlcase` *program puts my CoCo 3 in true lowercase while on a 32-column VDG screen in OS-9 Level II. If your CoCo 2 supports true lowercase, this program will work with OS-9 Level I.*

*Jean-Guy Cote*
*Clemsford, Ontario*
*Canada*

a

Thanks for the information. According to the OS-9 Level II manual on pages 6-89 and 6-102, `tmode type=1` or `xmode /dev type=1` achieves the same result. According to several readers, this was originally implemented in OS-9 Level I Version 2.0. As seen in the assembly-lan-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**Listing 1:** `tlcase.b09`

```
PROCEDURE tlcase
0000      DIM outpath,bt:BYTE
000B
000C      CREATE #outpath,"/d0/cmds/tlcase":UPDATE
0026
0027      FOR x=1 TO 31
0039        READ bt
003E        PUT #outpath,bt
0048      NEXT x
0053
0054      CLOSE #outpath
005A      SHELL "attr /d0/cmds/tlcase e pe"
0077
0078      DATA 135,205,0,31,0,13,17,129,55,0,19,0,1,84,76
00A9      DATA 67,65,83,197,134,80,183,255,34,95,16,63,6,135,184,35
```

**Listing 2:** `tlcase.asm`

```
00001                                nam   tlcase
00002                                ttl   True Lowercase
00003
00004                                ifp1
00005                                use   /dd/defs/os9defs
00006                                endc
00007
00008   0011             Type      set   PRGRM+OBJCT
00009   0081             Revs      set   REENT+1
00010
00011   0000 87CD001F                mod   Length,Name,Type,Revs,Start,Mem
00012
00013 D 0000             Stack     rmb   1
00014 D 0001             Mem       equ   .
00015
00016   000D 746C6361    Name      fcs   /tlcase/
00017
00018   0013 8650        Start     LDA   #80
00019 W 0015 B7FF22              STA   $FF22
00020   0018 5F                  CLRB
00021   0019 103F06              OS9   F$Exit
00022   001C 4B50DA              emod
00023
00024   001F             Length    equ   *
00025                                end

00000 error(s)
00001 warning(s)
$001F 00031 program bytes generated
$0001 00001 data bytes allocated
$1795 06037 bytes used for symbols
```

guage listing, the general technique is to store a value of 80 at address $FF22 for true lowercase.

### Creating a Boot Disk

*I need a little help with a bootlist for an OS-9 procedure. In the April 1988 issue on Page 150, there is an article on how to use* DeskMate 3 *with windows, the hi-res interface and a module called* `vdgint.io`.

*I understand the article and the basics as to how all this works. But from what I understand about OS-9, you just can't put together any bootlist. In Paul Ward's book,* Start OS-9, *Mr. Ward talks about a bootlist order bug (BLOB).*

*In order to create a new bootable disk with* `os9gen`, *this list must be in a particular order for it to work.*

*If anyone out there in CoCo Land is familiar with this article or if you have a bootlist with this module in it, I would appreciate hearing from you. Presently I'm using a customized version of* DeskMate 3 *(see the Letters to the Editor in May 1989.*

*My setup includes a 512K CoCo 3, two 40-track double-sided drives, a CM-8 monitor, a DMP-130a printer and a 1200-bps modem.*

*Ernest Bazzinottie, Jr.*
*Dorchester, Massachusetts*

The bootlist order bug seems to be very dependent on the particular Color Computer you are using. Some CoCo 3's rarely exhibit problems with the bootlist order bug while others may exhibit no end of problems. It's as if each CoCo 3 has a mind of its own. At any rate, the bootlist I use on the CoCo 3 at work is shown in Figure 1. This includes the driver and descriptor for the Tandy 35-meg hard drive and `/term` is a 32-column VDG screen. The most important detail is to keep all RBF devices in the same 8K block. This includes `rbf`, the floppy driver and descriptors, and hard drive drivers and descriptors. This can be determined by examining the offsets given by the `mdir e` command. Since each block is $2000 bytes, the offsets should be within $0000 to $1FFF, $2000 to $3FFF, $4000 to $5FFF, and so on. We initially had `clock.60hz` located between `cc3go` and `rbf.mn`, which placed all of the RBF devices within the same block except `d0_40d.dd` and `d1_40d.dd`. Even though this caused no problems on our system, we moved `clock.60hz` between `d1_40d.dd` and `scf.mn` to move `d0_40d.dd` and `d1_40d.dd` within the same block as the other RBF modules.

```
os9p2
ioman
init
cc3go
rbf.mn
cc3hdisk.dr
ddh0_35.dd
h0_35.dd
cc3disk.dr
d0_40d.dd
d1_40d.dd
clock.60hz
scf.mn
cc3io.dr
vdgint.io
windint.io
term_vdg.dt
w.dw
w1.dw
w2.dw
w3.dw
w4.dw
w5.dw
w6.dw
w7.dw
w8.dw
w9.dw
w10.dw
w11.dw
w12.dw
w13.dw
w14.dw
w15.dw
aciapak.dr
t2.dd
printer.dr
p.dd
nildrv.dr
nil.dd
pipeman.mn
piper.dr
pipe.dd
```

**Figure 1: Customized bootlist.**

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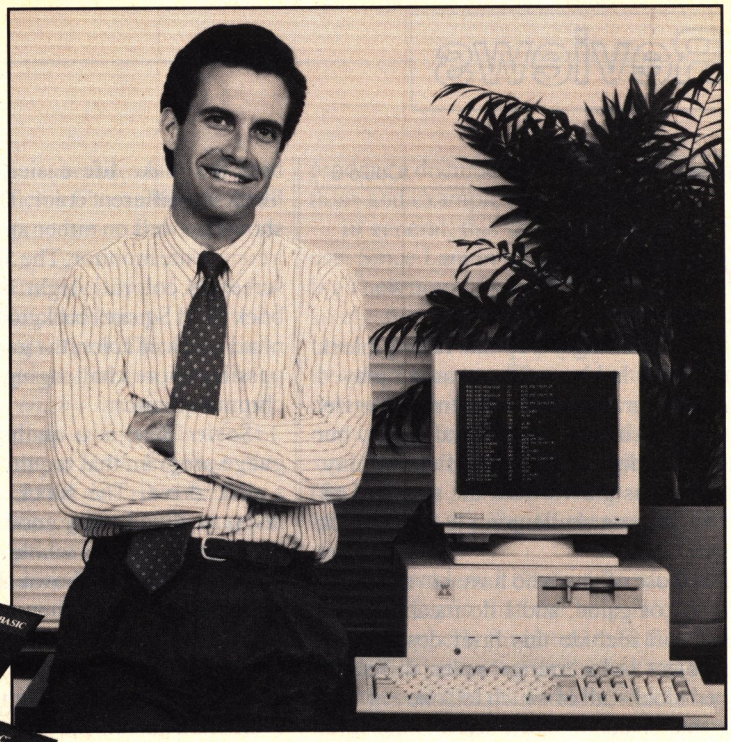

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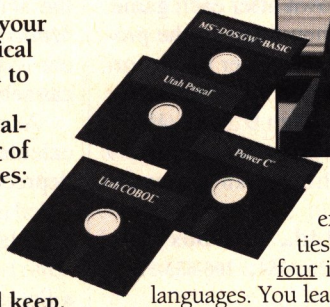


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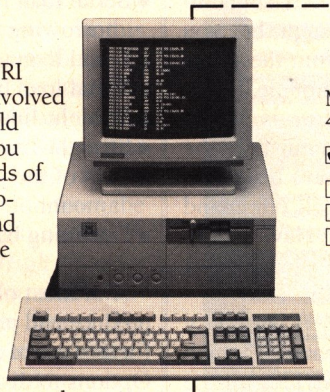

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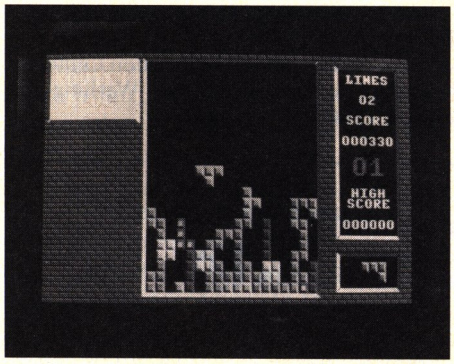
Game CoCo 3

# Soviet Bloc

The increasingly popular falling-block games have held my fancy since I played *Tetris*, the granddaddy of them all. *Soviet Bloc* is much like the original game, but with the addition of a larger field of play. The field has grown from the standard 10-by-20 to a more challenging 18-by-22 block surface.

For those of you who have never played this type of game, and I do mean both of you, I will include this brief description. The object is to arrange seven different-shaped blocks, all of which fall one at a time from the top center of the screen, into solid rows across the bottom of the screen. Completely formed rows disappear from the screen which causes unfinished rows to drop and fill the void. If you misplace the building blocks — and *you will* eventually — the shoddily built wall gets higher and higher until there is no room for a new block. The game ends at this point.

This seemingly easy task is complicated after reaching higher levels of play. With each new level the blocks fall a little faster, which reduces your reaction time. If you've ever been curious to see how well you can perform simple feats at high speed, then this game is a fun test. At times I felt like Lucille Ball when she was trying to wrap candies that were coming down a conveyor belt gone haywire. Eventually you'll slip, but it's all in good fun.




As the blocks fall, you rotate and move them into the proper positions via the arrow keys or the joystick and firebutton. A ping sounds when a new block falls into play or a block is moved or rotated. The ping is very helpful at higher levels of play where positioning must be fast and accurate. The next new block to fall is shown in an on-deck box. To make life easier, each shape of block is a different color. The color scheme shows up well on either an RGB monitor or a composite monitor. The *Soviet Bloc* game screen is colorful, right down to the red brick (Red Square) background. If you don't mind a lack of color, the game is fun — and possibly more challenging — on a monochrome monitor.

*Soviet Bloc* is a quality machine-language program that requires a CoCo 3 and a disk drive. The block movement and response time is very good. This game can be enjoyed by the whole family. The 10 highest scores are shown after each game. This list is cleared when you exit the program, which gives every player the opportunity to have a high score. You can start the game at any level between 0 and 9. However, the right to play any level above 9 must be earned. Which level can you reach?

**(Eversoft Games, Ltd., P.O. Box 3354, Arlington, WA 98223-3354; 206-653-5263; $19.95, plus $2.50 S/H)**

**— Tony Olive**

Finance CoCo 3

# High Finance

*High Finance* is a mouse-and-menu application program that gives you the ability to calculate parameters associated with investment income, loans and depreciation. The program is written in Microware C and runs under OS-9 Level II. A CoCo 3, OS-9 Level II, *Multi-Vue*, and at least 128K (but preferably 256K or 512K) are required for this program. Two disk drives or a hard drive, a RAM disk and a printer are also recommended. *Multi-Vue* is not actually necessary to run the system, but you need the `windint` module from the package. Therefore, since this module is not available separately, *Multi-Vue* is necessary. This does not mean you must run the program from *Multi-Vue*. I have been running it directly from the Shell command line by simply entering `hifi`. Having both options is nice and should please most people.

*High Finance* installation is very easy and straightforward. The manual, which I'll say more about later, provides all the detail of setting up directories and copying the appropriate files to the correct directories. After copying all the files, you are encouraged to set up a RAM disk. This is not provided with *High Finance*, but there are many varieties of RAM disks available on the information services. Using a RAM disk greatly speeds the execution of the program's extensive calculations. However, a RAM disk is not required to run *High Finance*. Those of you who have 128K need to be aware that *High Finance* cannot be run at the same time as *Multi-Vue*. In this case you would run *High Finance* from the command line.

Once you have *High Finance* running, the screen appearance is similar to most *Multi-Vue* applications, with a menu bar across the top of the screen from which you can select a pull-down menu with the mouse.

As noted before, *High Finance* performs calculations for investments, loans and depreciation. The following list, as provided in the manual, illustrates the financial calculations that *High Finance* performs:

- Present value
- Present value of an annuity
- Future value
- Future value of an annuity
- Sinking fund
- Time required to reach a desired value
- Time required for an annuity to reach a desired value
- Rate required to reach a desired value
- Rate required for an annuity to reach a desired value
- Income produced
- Rate of return
- Regular loan payment/cost of borrowing
- Regular loan balloon payment/cost of borrowing
- Regular loan term
- Regular loan balance
- Serial loan payment
- Serial loan final payment/cost of borrowing
- Serial loan term
- Serial loan balance
- Straight-line depreciation rate
- Straight-line depreciation amount
- Sum of the years digits depreciation amount
- Declining balance depreciation amount.

For most of these calculations, you can produce and print the appropriate schedules for the type of calculation being performed. Options to display the summary results or the full schedule are simply a mouse click on a pull-down menu. In addition, the Tandy

applications programs that come with *Multi-Vue* (clock, calendar, calculator, etc.) are all accessible from the *High Finance* screen.

For example, let's consider the problem of determining the amount of a monthly mortgage payment. Selecting the Loan option from the menu bar produces a pull-down menu for the various loan calculations. Under the Regular Loans option, select the payment/borrowing cost selection. A data entry window appears and requests information about the original loan amount, the annual percentage rate, the number of payments per year and the term of the loan. After entering each of these parameters and insuring the accuracy of the data, simply click on the Done option and wait for calculation of the summary results. For those who don't like all this mouse clicking, you can use the alternate approach and press ALT plus a letter, such as ALT-D for Done.

Now suppose you want to recalculate the mortgage, but at a different interest rate. Just move the mouse to the interest rate line, click and enter the new rate. Again, click on the Done option or press ALT-D and new results are calculated. If you want to start all over again, click on Clear and enter all new data. This approach is used throughout all of the *High Finance* options, except different prompts appear in the data entry window, appropriate for the selected type of calculation.

Continuing with this example, suppose you have determined the correct mortgage parameters and want a printed amortization schedule. Clicking on the View selection of the menu bar allows you to change from the Result option to the Schedule option. A data entry window appears and requests the beginning date of the loan. After entering the appropriate date, the loan amortization schedule is prepared. This is a time-consuming process if you are considering monthly payments over 30 years. In this case a RAM disk is more beneficial as compared to a hard disk. Once the schedule has been calculated and displayed on the screen, you can scroll through the schedule by clicking on the scroll bars. For a hardcopy, select the Files option from the menu bar and choose the Print option. A word of caution, however: *High Finance* uses `cocopr`, the document formatter supplied with *Multi-Vue*, which means that `cocopr` must be located in the same execution directory as *High Finance*. If you prefer another method of printing the schedules, use the Save option from the Files menu and save the schedule as a standard text file to disk. Such a file can then be read into most word processors and edited as needed.

An extremely nice feature of *High Finance*, besides the calculations, is a function referred to as MV-Tutor. Once you click on the MV-Tutor option, you can obtain help for all options in *High Finance* by simply clicking on the pull-down menu. Instead of doing the calculation, *High Finance* displays a Help screen that describes the function of that particular option. Clicking again on the MV-Tutor option resets *High Finance* back to the calculation mode. This is an extremely useful method of providing on-line help.

If the on-line help is not sufficient, consult the 68-page manual. The manual is not intended as a financial textbook, but it meets the requirements of a software manual. Simply put — the manual is excellent! I have been reviewing CoCo software for THE RAINBOW since about 1983 and have rarely seen a good manual. This is one of those rare occasions. The author spent a considerable amount of time planning the format and organization of the manual to produce a document that provides explanations and examples of each option.

In general, this software is very easy to use. Since I am in the process of considering a new home, I used *High Finance* extensively for performing mortgage calculations. I found it to be comparably accurate to other sources. The program is nicely designed so that when you are doing a number of repetitive calculations, it is a simple matter to change a single parameter (for example, the interest rate) and recalculate without having to reenter all of the parameters.

One problem I observed with the MV-Tutor option is that the help information was not properly formatted to fit the display window. In other words, the line was longer than the width of the window, which caused ugly word wrap. This was not a problem after I loaded the Help file into *Dynastar* and reformatted the text file. However, I suggest the author correct this problem as the purchaser should not have to do this.

As I hope you can see, I am extremely pleased with this excellent software package, and I highly recommend it for your consideration. At the suggested retail price,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the program is a steal and should be a part of your applications library.

**(MV Systems, P.O. Box 818, Arvada, CO 80001-1682; $24.95)**

**— Donald Dollberg**

Home Help | CoCo 3

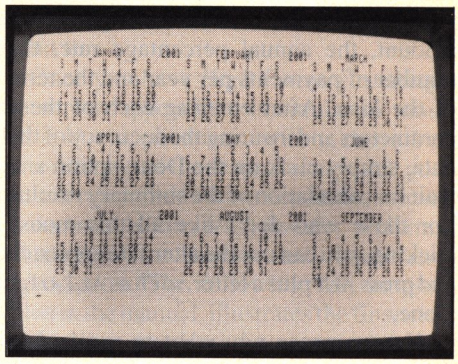
## *Calendar 1*

*Calendar 1* is a handy, home utility written for the CoCo 3 with one disk drive. Two versions of the program are supplied on the disk. One version runs on the stock 128K or 512K CoCo 3 and the second version requires 512K and Microcom's *Disk Boot*. This means that by using Disk BASIC, *Calendar 1* can be used as a stand-alone product, or with the extra programming space provided by *Disk Boot*, it can be added to larger programs as a modular component. A full hardcopy printout of the BASIC source code for *Calendar 1* is provided. *Calendar 1* is not copy-protected, so you can make a backup for your own safekeeping.

*Calendar 1* allows for onscreen review of any year between 1800 and 2050. There seems to be a little math error, though — while the documentation claims this is 242 years, I had no problem seeing calendars for all 251. All of the calendar years are based on one of 14 calendar layouts. In other words, the days of the week each year fall on dates in one of 14 ways.

The computer displays on two screens a simple calendar for the 12 months of the selected year. (There is no room to add reminders and what not.) You can toggle backward and forward between the two screens on which the months are displayed. The 80-column, Hi-Res text capability of the CoCo 3 is tested with black printing on a white background in an easy-to-read three-column format.

My only complaint with *Calendar 1* is its failure to provide an option to print the calendars. Perhaps a screen print utility would suffice, but this is not mentioned in the documentation. Aside from this one



shortcoming, *Calendar 1* is a nice addition to your software library. Check to see on which day of the week a particular event occurred (or will occur), or use it to plan your vacations for the next 59 years.

**(R.S. Research Associates, 479 South River St., Wilkes-Barre, PA 18702; $25)**

**— Jerry Semones**

Programming Language | OS-9/68000

## *Microware Basic*

Most computer users have at least a passing familiarity with BASIC. As such, it is a classic of the programming languages. No, it isn't the fastest language, and little commercial software is written in BASIC. However, it is easy-to-learn, easy-to-use and it provides a quick way of solving problems using a computer. *Microware Basic*, designed for use with OS-9 on 68000-based computers, is no exception.

We received Version 2.3 from Microware for review. Included is a 3½- or 5¼-inch disk (in Universal format) and a 180-page manual. On the disk are two executable files in the CMDS directory: `basic` and `runb`. The first program is the actual *Microware Basic* environment, which includes the BASIC compiler, a line editor and an interactive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debugger. The run-time program, runb, is a stripped-down version that executes packed BASIC programs from the OS-9 command line (outside the BASIC workspace).

The manual is divided into two parts. The tutorial section relates the intricacies of BASIC in general and *Microware Basic* in particular. Several examples are given that show how to use the language efficiently. The remainder of the manual is a reference guide that gives explanations for individual commands and provides several appendices and sample programs.

**With a little practice, it is easy to create very powerful and efficient problem-solving tools with *Microware Basic*.**

*Microware Basic* is powerful in that it combines the best features of Pascal (data structures and program modularity) and FORTRAN (I/O formatting) with the ease of BASIC. Line numbers are not required, though you can use them if you want. (For control-transfer commands, such as GOSUB and GOTO, line numbers are required — but only on the lines to which control is transferred.) In fact, the environment makes it easy to use separately named procedures for subroutines — your overall program becomes a group of related program modules. Data is passed between the separate procedures as parameters.

Variables can be defined as any of five different types: Byte, Boolean, Integer, Real and String. The last three types of variables are self-explanatory, but the first two might seem a little strange to the uninitiated. Types Byte and Boolean have certain uses, as described in the manual, that simplify program writing and flow. These data types can be used in conjunction with the TYPE command to create complex data structures. For example, you could define an array of records for a checkbook. Each single array element, or record, can contain data of mixed types — you can use numbers in some fields and text strings in others. *Microware Basic* supports one-, two- and three-dimensional arrays.

In addition to a "standard" repertoire of BASIC commands, including math/trig functions, *Microware Basic* provides for several useful control structures. These are:

```
IF/THEN/ELSE/ENDIF
FOR/TO/STEP/NEXT
REPEAT/UNTIL
WHILE/DO/ENDWHILE
LOOP/ENDLOOP
EXITIF/THEN/ENDEXIT
```

In the right hands, these features can lead to highly structured programs. And the manual does a good job covering the subject of program optimization. With a little practice, it is easy to create very powerful and efficient problem-solving tools with *Microware Basic*.

The package holds no surprises for those already familiar with BASIC09. There are some noteworthy differences, however. The system includes a form of inkey that returns the number of bytes waiting in the buffer, not the value of the pressed key. You'll have to use GET commands to read single keystrokes. While syscall is not included as an executable program on the disk, the 68000 assembler source code is provided in the manual. Further, *Microware Basic* does not include any graphics


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support, as does BASIC09 with `gfx` and `gfx2`. This is likely due to the diversity of system configurations seen in the 68000 market. BASIC09 was designed to be run on a specific computer with a known minimum configuration. On the positive side, because of abilities of the 68000 processor, *Microware Basic* uses 4-bytes for integers, whereas BASIC09 uses only two bytes. Similarly, *Microware Basic* uses a full eight bytes for real values and variables, as compared to BASIC09's five.

The most noticeable (and perhaps most important) difference between BASIC09 and *Microware Basic* concerns usable memory. Since BASIC09 is designed to run under OS-9/6809, its users are limited to the 64K address space allowed by the 6809 microprocessor. As it is designed for 68000-based computers, *Microware Basic* supports a workspace of up to 16 megabytes for BASIC programs. (Not that anyone will ever write a program that big, but it's nice to know the space is there.)

I have two negative comments about the functionality of the package. First, there appears to be a small bug that interferes with memory requests. Supposedly you can use the `MEM` command to alter the amount of memory allocated to your program workspace. I found I could reduce the amount of allocated memory, but all efforts to increase it with `MEM` failed. If I didn't request enough memory upon entering BASIC, I had to save my source code, then exit and reenter BASIC, requesting more memory the second time around.

The second negative comment is that accidentally pressing the Escape key causes you to exit BASIC — no questions asked! You end up back at the system prompt and if you haven't saved your source code, it's gone and you'll have to enter it again. While Microware claims this is intended in *Microware Basic*'s design, I consider it a frustrating bug. It also appears in BASIC09 and I feel it should have been changed.

*Microware Basic* is a fairly powerful version of a common language. I encountered few problems using the package. (Of course I did create a few programming errors of my own, but the debugger helped me correct those quickly.) Despite its power and usefulness, however, I do find the package outrageously overpriced for this market. At $500 a pop, it is way out of reach for most users — especially those who could use it most. Obviously it is priced for the VME market and industrial users, and not for the single end-user. Who knows, though? If enough interest is generated or if it becomes available in a "bundled" package, the actual price you pay could be lower. Unfortunately, I find it hard to recommend *Microware Basic*, purely on a bang-for-your-buck basis. Otherwise it is an excellent tool for program development.

**(Microware Systems Corporation, 1900 N.W. 114th Street, Des Moines, IA 50322, 515-224-1929; $500)**

**— Cray Augsburg**

Potpourri CoCo 1, 2 & 3

# T&D Software — *Issue #105*

The 105th issue from T&D Subscription Software contains a wide variety of programs for your CoCo 1, 2 or 3. These programs are supplied on either a floppy disk or cassette, both of which include a software menu for running the programs. T&D Subscription Software *Issue #105* contains the following programs:

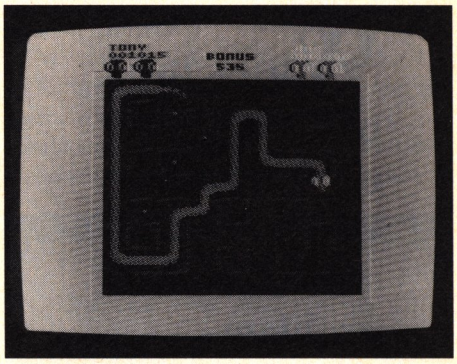
*Robocrook* — a 32K text adventure that features a robotic menace and other characters such as Spuds, Freddy and Norman. Uses customary adventure syntax, such as N, S, E, W, and verb/noun combinations.

**T&D Subscription Software *Issue #105* lives up to the reputation set by previous issues. It provides excellent programs for the Color Computer at a fair price.**

*Credit Card Accountant* — a handy way to keep track of your charges on up to 12 credit cards. Supports a printer and saves data to tape or disk.

*ABCs 'n 123s* — a series of four cute guessing games in which you try to guess the computer's selection — clues are provided. You can also let the computer try to guess your selection.

*Antique Collector* — a nice home application that keeps a permanent record of your treasures, their history, value, etc. Data can be saved to tape or disk and printed as hard copy.




*Four Score* — a board game based on the old game of *Wari*. You must move stones around pots to collect any set of four. You start out with 12 pots and four stones. Additional onscreen instructions are provided for this challenging puzzle-type game.

*Quick Tax* — provides a quick way to estimate your tax liability. Uses standard information, such as number of dependents, single or married and head of household.

*Hi-Load* — a disk-only utility that allows you to use disk tracks 35 and higher (depending on your drive). Lets you run programs from the higher tracks without first having to copy them to lower tracks.

*Quad Education 3* — a menu-driven CoCo 3 program that provides students with lessons involving capitalization, forms of 'be,' compounds and synonyms.

*Smurf Quest 3* — a CoCo 3 game that uses the right joystick to control Hefty Smurf up and down ladders and platforms. It's written in machine language, so it's fast and smooth with nice colors and sound effects.

*Buzzworm* — the old Tom Mix Software favorite. Use a keyboard (which is difficult) or a joystick to guide your worm around the maze to eat snake bait. The worm grows longer when he eats, but moves faster when he doesn't. A real challenge!

T&D Subscription Software *Issue #105* lives up to the reputation set by previous issues. It provides excellent programs for the Color Computer at a fair price.

**(T&D Subscription Software, 2490 Miles Standish Dr., Holland MI 49424; $8, tape or disk)**

**— Robert Gray**

# Received and Certified

*The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, your assurance that we have seen the product and have ascertained that it is what it purports to be.*

**Super Sleuth — OS-9/68000**, a collection of programs that enable users to examine and modify binary program files on disk or in memory. Programs can be disassembled into source code that can be displayed, printed or saved to disk. Labels produced by *Super Sleuth* can be changed globally to labels of the user's preference. Cross reference listings of labels can be generated to aid in debugging or modifying the program. Programs in ROM can be altered, saved on disk and later be used to program a new ROM. *Frank Hogg Laboratory, 204 Windemere Road, Syracuse, NY 13205, (315) 469-7364; $100, plus $5 S/H.*

**Data Windows Version 1.1b**, a complete database package for the CoCo 3. It requires OS-9 Level II and at least 256K. Gives complete access to all functions necessary in manipulating complex databases. *Data Windows* allows you to manipulate databases with windows (hence the name) — you can define many different databases for all of your needs. *Data Windows* generates reports and mailing labels. Picture elements are used to define how each record will look on paper. In addition to the pictures, report-break fields and report-total fields can be defined. *CoCo PRO! Products, 1334 Byron Ave., Ypsilanti, MI 48198, (313) 481-3283; $59.95, plus $4 S/H.*

**MicroMessage No. 1**, short, 10-minute messages suitable for Sunday School, nursing-home ministries and other similar situations. Each message includes an exposition of the passage it addresses along with stories and anecdotes to illustrate the passage. Each message is accompanied by a file of expository notes on the passage to aid you in expanding or customizing the message for your own particular needs. Both the messages and the expository note files are saved in ASCII (without control codes) to facilitate importing into your own word processor. A reader program is included for those without a word processor. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485, (708) 998-1656; $5.*

**KJV on Disk, #22**, Isaiah 1-37 from the King James version of the Bible in ASCII files for the CoCo 1, 2 and 3. A word processor or text editor is recommended for viewing the files. Requires at least 32K and one disk drive. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485; (708) 998-1656; $3.*

**KJV on Disk, #23**, Isaiah 38-66 from the King James version of the Bible in ASCII files for the CoCo 1, 2 and 3. A word processor or text editor is recommended for viewing the files. Requires at least 32K and one disk drive. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485; (708) 998-1656); $3.*

**CoCo Cassette #106**, a variety of programs presented monthly for the CoCo 1, 2 and 3. This month includes: *Stock Portfolio*, a program to help you analyze your stock and security transactions; *The Barrel*, a puzzle game; *Service Manager*, keep track of your small business customer service records; *Crosums Puzzle*, an addition puzzle; *Diamond Quest*, an adventure game in which you are an explorer searching for a huge diamond; *Job Skills*, a program that maintains a list of job skills and positions that require those skills; *Job Applicant*, works in conjunction with *Job Skills*; *Eldus 3*, a CoCo 3 graphics-adventure game; *Break-In 3 Part 2*, a game similar to Breakout; *Katerpillar II*, plays similar to the popular centipede game. *T&D Software, 2490 Miles Standish Dr., Holland, MI 49424, (616) 399-9468; $8.*

**Check Writer**, a menu-driven program that allows you to use a printer and ordinary bank checks to help handle your monthly bills. Each time you enter data into the program, a file is created that includes the names of the people and firms to whom you write checks, along with other pertinent information. The program automatically sets up a two-column, alphabetic screen index of your business accounts. To print a check, select a name and press ENTER. Versions available for the CoCo 3 or CoCo 1 and 2. *The Trading Post, P.O. Box 3453, Carbondale, IL 62902-3453, (618) 457-5258; $19.95, plus $3 S/H.*

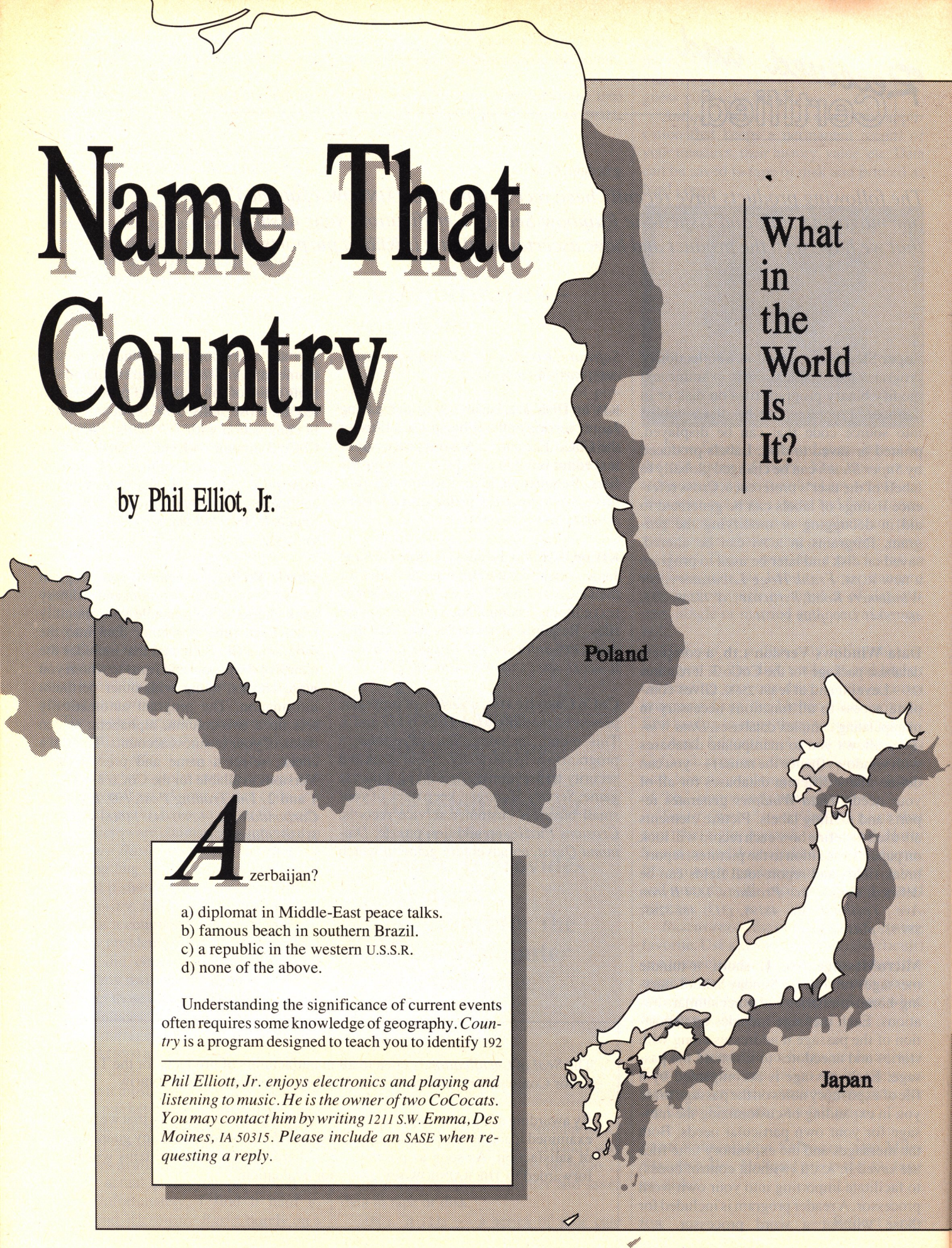
The *Seal of Certification* is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the program does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.

# Name That Country

## What in the World Is It?

by Phil Elliot, Jr.




Azerbaijan?

a) diplomat in Middle-East peace talks.
b) famous beach in southern Brazil.
c) a republic in the western U.S.S.R.
d) none of the above.

Understanding the significance of current events often requires some knowledge of geography. *Country* is a program designed to teach you to identify 192

---

*Phil Elliott, Jr. enjoys electronics and playing and listening to music. He is the owner of two CoCocats. You may contact him by writing 1211 S.W. Emma, Des Moines, IA 50315. Please include an SASE when requesting a reply.*

countries around the world. Enter the program and save it to tape or disk. To run it, first enter PCLEAR1. Then enter RUN"COUNTRY". The title screen appears and you are given a choice of nine areas of the world about which to test your knowledge. These areas, shown as menu options, are South America, Africa, Southeast and Southwest Asia, Western Europe and Scandinavia, Canada and Alaska, U.S.S.R., Central America, or all of the above in the order of their screen appearance.

After you select one of these options, a map for the appropriate area is displayed on the screen. One country on the map appears in white, and you are asked to name that country. Although the program is called *Country*, not all answers are countries; some answers may be provinces, territories or republics. Type your answer and press ENTER. If you don't know how to spell the name of a country, or if you just want a list of countries from which to choose, press the up arrow. After viewing the list of possible choices, you can press any key to return to the graphics screen. Your score is displayed onscreen throughout play, and when you complete a screen, the percentage of correct responses is shown. ❑

CoCo 3

```
4 ..... 25Ø    94 ..... 44    183 ..... 82
8 ..... 17      1ØØ ..... 133  189 ..... 93
16 ..... 88     1Ø4 ..... 147  195 ..... 113
23 ..... 146    1Ø9 ..... 12   2Ø1 ..... 5
27 ..... 192    114 ..... 241  2Ø6 ..... 255
32 ..... 12Ø    119 ..... 253  211 ..... 92
37 ..... 219    124 ..... 1Ø1  215 ..... 244
43 ..... 132    129 ..... 74   22Ø ..... 84
47 ..... 4      134 ..... 43   224 ..... 5
52 ..... 187    139 ..... 64   228 ..... 19
57 ..... 161    145 ..... 66   232 ..... 217
63 ..... 33     151 ..... 168  238 ..... 86
68 ..... 118    158 ..... 148  241 ..... 165
74 ..... 2Ø3    164 ..... 17Ø  END ..... 88
81 ..... 17Ø    169 ..... 6Ø
87 ..... 176    173 ..... 248
```

**The Listing:** COUNTRY

```
Ø 'NAME THAT COUNTRY
** BY PHIL ELLIOT, JR.
1 'COPYRIGHT (C) SEPTEMBER 1991
   ** BY FALSOFT, INC.
   ** RAINBOW MAGAZINE
2 ONBRKGOTO2:POKE65497,Ø:HSCREEN
2:PALETTEØ,Ø:PALETTE14,32:PALETT
E15,4Ø:HCOLOR14
3 HDRAW"BM56,78M+2,-7M+8,-16M+5,
-5U2M-6,+3M-8,+4M-7,+7M-8,+1ØM-2
,+5M-1,+5M-2,+6M+2,+2R3M+4,-12M+
8,-16M+2,-5BM58,9ØM+9,-9M+22,-24
M+3,-4U5M-2,-1M-2,+3M-5,+18M-4,+
18M+7,-1M+8,-5NM+5,-4M+3,+4R2M+6
,-3M+5,-4NM+2,-3R3M+2,-1M+12,-1Ø
M+6,-1ØM+1,-2M-5,+2"
4 HDRAW"M-5,+5M-4,+12M-4,+13BM11
4,61L4M-3,+2DM+7,+2BM157,61M-11,
+6M-8,+5DM+2,+2M+8,-1M+8,-3M+5,-
3M-2,-1M-6,+2M-3,+2M-1Ø,+9M-2,+2
M+3,+1M+5,-1M+8,-4M+16,-7M+16,-1
ØM-6,-2L5M-3,+1M-8,+14D5M+4,+1M+
4,-1M+8,-4M+8,+5M+6,-5M+4,-5U4M-
1,-1L4M-5,+7M-9,+13D7"
5 HDRAW"RM+8,-3NM+3,-3D3R4M+4,-3
M+4,-4BM192,82M+3,+2M+2,-1M+5,-2
U7M2ØØ,75M+2,+4M+3,+1M+3,-1M+1Ø,
-1ØM+2,-3M-12,+13M+4,+4M+5,-1M+9
,-9M+7,-5M+3,-4U3M-3,+1M-6,+1ØD5
M+2,+1R5M+4,-2M+4,-5M-2,-2L55M+5
,+3BM2Ø1,61M+5,+1M+5,-1BM272,63M
-75,+55M+7,-5M+8Ø,-43"
6 HDRAW"BM272,89M-1Ø,+3M+5,+2":H
COLOR15:HPRINT(3,22),"C 199Ø BY:
 Phillip R. Elliott Jr.":HCIRCLE
(27,179),7:PLAY"T1L1P1P1"
7 POKE41598,255:ONBRKGOTO37:WIDT
H4Ø:CMP:ATTR2,Ø:CLS1:BX=RND(-TIM
ER):DIMX(48),Y(48),A$(48),X1(48)
,Y1(48),B(48):POKE&HFØ15,33
8 PRINT"    WHICH AREA:":PRINT"
  1)SOUTH AMERICA":PRINT"   2)AF
RICA":PRINT"   3)AUSTRALIA":PRIN
T"   4)S.E./S.W. ASIA":PRINT"
5)WESTERN EUROPE/SCANDINAVIA":PR
INT"   6)CANADA/ALASKA":PRINT"
 7)U.S.S.R.":PRINT"   8)CENTRAL
AMERICA"
9 PRINT"   9)ALL OF THE ABOVE":Z
Z$=INKEY$:PRINT:PRINT"   WHICH O
NE?(1-9)"
1Ø AN$=INKEY$:IFAN$<"1"ORAN$>"9"
THEN1ØELSECN=VAL(AN$)
11 WIDTH32:PALETTEØ,32:PALETTE1,
Ø:PALETTE2,63
12 HSCREEN4:POKE65434,32:POKE&HF
F98,128:POKE&HFF99,&H3D:POKE&HEF
8F,24:POKE65434,32
13 HCOLOR1
14 FORX=1TO7:READZ(X):NEXT:IFCN=
1ORCN=9THENELSEFORX=1TOCN-1:FORT
=1TOZ(X):READZ$:NEXTT,X
15 IFCN=9THENFORP=1TO8 ELSEP=CN
16 ONP GOSUB4Ø,58,1Ø7,127,169,2Ø
6,22Ø,236
17 READA:FORX=1TOA:READA$(X):NEX
T:FORX=1TOA:READX(X),Y(X):IFY(X)
>2ØØTHENY(X)=Y(X)-1ØØØ:READX1(X)
,Y1(X)
18 NEXT:READN$,T,U,V,W,X9,Y9:HPR
INT(T,U),N$:HPRINT(V,W),N$
19 FORO=1TOA
2Ø B=RND(A):IFB(B)=-1THEN2ØELSEB
(B)=-1
21 HPAINT(X(B),Y(B)),2,1:IFX1(B)
=ØTHENELSEHPAINT(X1(B),Y1(B)),2,
1
22 HCOLOR1:HPRINT(15,24),"WHAT C
OUNTRY IS THIS? "+STRING$(35,32)
:PO=38:ZZ$=INKEY$
23 HPRINT(PO,24),CHR$(255)
24 AN$=INKEY$:IFAN$="^"THEN35ELS
EIFAN$=CHR$(13)THEN28ELSEIFAN$=C
HR$(8)THEN26ELSEIFAN$=CHR$(21)TH
EN27ELSEIFAN$>="A"ANDAN$<="Z"ORA
```

```
N$=" "ORAN$="-"ORAN$="."THENELSE
24
25 IFLEN(IN$)=30THEN24ELSEIN$=IN
$+AN$:HPRINT(PO,24),AN$:PO=PO+1:
GOTO23
26 IFPO=38THEN24ELSEIFPO=39THENH
PRINT(38,24),"  ":PO=38:IN$="":G
OTO23ELSEPO=PO-1:HPRINT(PO,24),"
  ":IN$=LEFT$(IN$,LEN(IN$)-1):GO
TO23
27 IFPO<=39THEN26ELSEIN$="":HPRI
NT(38,24),STRING$(32,32):PO=38:G
OTO23
28 IFIN$=""THEN23ELSEHPRINT(15,2
4),STRING$(55,32):IFIN$<>A$(B)TH
EN30ELSEHPAINT(X(B),Y(B)),0,1:IF
X1(B)=0THENELSEHPAINT(X1(B),Y1(B
)),0,1
29 HPRINT(15,24),"CORRECT. HIT A
NY KEY":CO=CO+1:GOTO32
30 HPAINT(X(B),Y(B)),1,1:IFX1(B)
=0THENELSEHPAINT(X1(B),Y1(B)),1,
1
31 HPRINT(15,24),"WRONG. THE ANS
WER IS "+A$(B)+". HIT ANY KEY":W
R=WR+1
32 HPRINT(X9,Y9),"SCORE: "+STR$(
CO)+" OUT OF"+STR$(CO+WR):EXEC44
539:HPRINT(15,24),STRING$(55,32)
:IN$="":ZZ$=INKEY$:NEXT
33 FORX=1TOA:A$(X)="":B(X)=0:X(X
)=0:Y(X)=0:X1(X)=0:Y1(X)=0:NEXT
34 IFCN=9THENHCLS0:NEXT:GOTO37EL
SE37
35 HSCREEN0:WIDTH40:CLS1:R=0:FOR
X=1TOA STEP2:LOCATE0,R:PRINTA$(X
);:LOCATE20,R:PRINTA$(X+1);:R=R+
1:NEXT
36 ME$="HIT ANY KEY TO RETURN":A
TTR3,0:FORX=2TO21:LOCATE18,X:PRI
NTMID$(ME$,X-1,1);:NEXT:ATTR2,0:
LOCATE39,23:EXEC44539:POKE59108,
230:HSCREEN4:POKE59108,231:POKE&
HFF98,128:POKE&HFF99,&H3D:POKE65
434,32:ZZ$=INKEY$:GOTO24
37 CMP:WIDTH40:CLS1:POKE41598,3:
POKE282,255:POKE41598,3:WIDTH32:
POKE65496,0:CLS1:POKE&HF015,170:
PRINT"TOTAL:"CO+WR:PRINT:PRINT"R
IGHT:"CO:PRINT"WRONG:"WR:PRINT"P
ERCENTAGE:";:IFCO+WR=0THENPRINT"
0":ENDELSEPC=CO/(CO+WR):PRINTINT
(PC*10000)/100:END
38 DATA55,154,58,123,111,54,60
39 REM**** SOUTH AMERICA ****
40 HDRAW"BM222,7R5M+2,-1M-3,-1L3
M-7,+2M-5,+2L10M-5,+1DM-8,+2DM-4
,+1M-4,+4M+3,+3M-2,+2M+1,+2M-3,+
3M-6,+1D2M-4,+2L7D2M-7,+2M+5,+5R
3E2M+1,+1M-3,+2"
41 HDRAW"D3R6M+7,-4M+15,-3M+4,-4
M-7,-2R5M+5,+2R7M+5,+4R20M+5,+2M
-4,+3M+5,+2M+4,-8M-5,-3M+9,-1M-5
,-1M+2,-1R7M+8,-1D2R4M-10,-10M+2
,-3M-7,+1L9M-10,-3M-5,+1M-9,-5M+
4,-5M222,7BM179,29M193,34"
42 HDRAW"BM260,34M+10,+2M+10,-2M
-8,-7M+7,+1R10M+15,-3UM-6,-2M+8,
-2M-2,-1L2M+5,-3L6U2M-14,-1UR5M-
20,+1L7U2M-10,+1M-10,-2M-4,-2L2D
2R2M-10,+2D4M-3,+1L5M222,7"
43 HDRAW"BM163,44M-10,+3M+5,+3L3
M+13,+4M+7,+6M+10,+5R5M+3,+4DM+2
3,+6M+10,+1M+7,+3M+5,-2UM+3,-1U2
M-5,-2R5M+5,-3U5M-6,-3L9U5M-6,+1
M-7,-1L4M-3,-3M+2,-4R2H2M+12,-4M
236,47"
44 HDRAW"BM307,16M+10,+4M+7,+3M+
3,+2M-3,+2M+5,+3M+4,+5M-9,+1L7M-
8,-1U4M-3,-3M304,25"
45 HDRAW"BM324,23M+22,+1M-3,+3M+
4,+4M-2,+1M-3,+1M-5,-1M-3,+1M333
,35"
46 HDRAW"BM233,80M+1,+18M-8,+10M
-2,+4D7M-10,+7M-3,+6D4M-3,+3D4M+
3,+1E2F3M-3,+2D5M+4,+2M-2,+1L3M-
3,+4M-2,-2L4M+2,+4M+10,+4M-7,-1D
M+2,+1L3D3RM-5,+2DM+5,+2L2D9LD2M
+11,+1M+11,+2R14NU8"
47 HDRAW"R13F1M+7,-2M-13,-3M241,
180U3M-7,-1L15M-1,-2U3L3U5M+5,-7
M+5,-7M-3,-1R5M-4,-2U2L2M+3,-5M-
2,-2R2U3R3M+2,-4M-2,-4M+1,-4E3U8
M+2,-7M+10,-7U3H2M+4,-4M+13,-5M-
5,-1M-5,-2U5M241,76"
48 HDRAW"BM303,175R4UM+9,-1R5DM+
2,-1M+4,+1D2L5M-3,+2L3U2M-10,+2M
303,175"
49 HDRAW"BM240,61M+5,+1M+24,-3D3
M+5,+3R10M+15,+3R2M+3,+3D5R15D2F
2D2M-4,+3L2M-8,-2L15M-8,+5M-12,+
1M-10,-1M253,85"
50 HDRAW"BM284,88M+8,+4M+8,+3M+1
1,+1F2R7F2M-5,+5M+12,+1M+10,-2M+
5,-4M+2,-4L7U3L15M317,85"
51 HDRAW"BM344,100M+10,+1D3L3M-2
5,+9R7M+3,+2R7M+11,+2M+10,+5M+8,
-9R5D2M+15,-8U7M+20,-3R5U2R25M+1
8,-15U7M+3,-3M+8,-1M+3,-3M+17,-6
U5M-5,-3L15M-20,-4L15HL10G2M-2,-
2M-24,-2L2M-5,+2L15M+15,-1M+5,-3
L15M-10,+1"
52 HDRAW"UM+14,-3U2L5U3M-5,-4M34
6,24BM374,31M-13,+4M-5,+1L10U5"
53 HDRAW"BM326,113M321,121M+4,+3
M+10,+1R12M364,122"
54 HDRAW"BM241,177M-3,-8R7M+3,-1
U3M+15,-5U2L10M-5,-3M+5,-2M+7,-2
R5U5M+6,-2L5U2R5M-4,-5M+2,+1R15M
+2,-1U5M+6,+1M+25,-1M+9,-5M321,1
21"
55 DATA15,COLUMBIA,VENEZUELA,GUY
ANA,SURINAME,PERU,BRAZIL,BOLIVIA
,PARAGUAY,CHILE,URUGUAY,ARGENTIN
A,TIERRA DEL FUEGO,FALKLAND ISLA
NDS,ECUADOR,FRENCH GUIANA
56 DATA200,30,250,15,312,23,330,
25,200,50,357,58,267,73,312,88,2
37,1088,235,178,350,118,282,118,
256,187,307,176,177,38,357,30
57 RETURN:DATASOUTH AMERICA,2,12
,65,12,2,14
58 REM****** AFRICA *******
59 HDRAW"BM160,13M-7,-1M-6,+1M-7
,-2L4M-8,+5M-8,+1M-8,+1D2M-6,+2D
5M-12,+3M-17,+3R34U3M+14,-3M+24,
-1M+2,-2M+14,-5M-4,-2M160,13"
60 HDRAW"M+23,-5M+24,-1M+4,+1R12
M+3,-2M+5,+1R7M-3,+3M-3,+1D4M-3,
+2M+6,+4M+6,+5M+4,+6D5M+8,+3M+5,
+3M+16,+2M-68,+10L9M-2,-1M+4,-1M
-8,-2L5M-6,-4M-49,-9M111,33"
61 HDRAW"BM238,7M+5,-1M+2,+1R3M+
2,+1R4DM-4,+2M+4,+1D4M-6,+2DM+12
,+2M-10,+4D2M-4,+2L4M241,26"
62 HDRAW"BM260,21M+15,+1M+4,+1R8
M+3,+1DM+13,+1M+12,+2M+8,-1U5M+1
2,-1R8M+6,+1M+17,+2M-2,+2D2R3D20
M-1,+5L8M-64,-8M-8,+1M274,45BM40
7,114M-6,-4NM+6,-4R8M+2,-1R3BM40
0,172M+8,+1D3M-7,+2L4M-4,-2U2R6M
400,172"
63 HDRAW"BM366,24M+23,+2R13M+4,-
1R5UR8M+24,+1D5M-2,+3M-14,-5D3M+
9,+5M+7,+4M+5,+2D3M+8,+1DM367,48
"
64 HDRAW"BM111,33D5L23D8M-10,+3M
+2,+2M-31,+1U2M+7,-4M+12,-7M+6,-
1M77,33"
65 HDRAW"BM49,52M+5,+2R2M+2,+4D7
R6M+2,-1M+9,+1R6D2M+8,+2M+4,-1M+
9,-1M+4,-1M+2,+1R23M+4,-4M-5,-1M
-6,-20M131,38"
66 HDRAW"BM93,68M-2,+2M+2,+2M-1,
+2R12M+5,+1M+2,+2M+6,-1D3M+23,-1
M+2,-3M+10,-3M+8,-1M+5,-3M+16,-3
M+6,-1M+2,-1R8M+2,-2M206,55"
67 HDRAW"BM181,65M+13,+5M+9,+1M+
7,+2M+6,-4M+8,-1R4M+6,+2R2M+2,-1
R9M+2,+2R8M+2,-2R20M+7,-2M-3,-3M
+17,-6M294,45"
68 HDRAW"BM286,67M+6,+1M+4,+3M+4
,+2R2M-2,+1L4D2M+4,+1RM+3,+2M-3,
+2R15M+16,-3M+4,-1M+8,-1M+10,-3R
6M-6,-1L6M-2,-1U2M+4,-2M-4,-3M+7
,-2U3R8M358,53"
69 HDRAW"BM360,73D6M+15,+1M+4,+4
R8M+6,+4M+2,+2R8M+6,-1M+9,+2R16M
+12,-2M+13,-1M-4,-4M-12,-3M-3,-1
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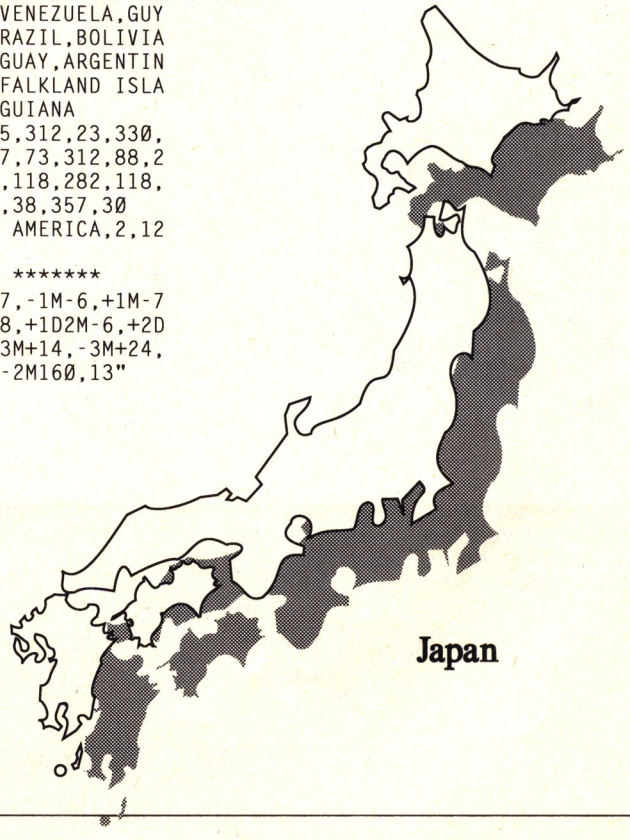

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UR9U5M+16,-5U7M+7,-3M+8,-3M-8,-2
M456,47"
70 HDRAW"BM58,65M-4,+3M-4,+1FR4D
2RR8M+2,-1M+7,+1D2M-4,-1M-13,+2D
2R22M92,74"
71 HDRAW"BM56,75M-3,-1M56,72"
72 HDRAW"BM310,96D4M-12,-1M-2,-1
L6D2M+5,+1M-2,+1D7L20M-3,+2M-4,+
1M+2,+1M+4,+1M+5,+4M+4,-2M+8,-1M
+6,-1DM+8,-1M+8,-3U4M+10,-4U5M+2
,-3M310,96"
73 HDRAW"BM56,77M+2,+2R5M+6,+2M+
3,-1R4M+2,-1M78,77"
74 HDRAW"BM69,81M+8,+3M+2,+2M+4,
-2M+6,-2R10D3M+4,+2R4M+2,+2M+10,
-2M+2,-1M117,79"
75 HDRAW"BM79,86M+8,+4M+4,+1M103
,87"
76 HDRAW"BM91,91M+12,+3M+18,+3U4
L4UM+2,-1M119,87"
77 HDRAW"BM140,78M+2,+1R17M+4,+2
U5R20M+4,-1M+4,+1M203,71"
78 HDRAW"BM210,73D4M-6,+3D5M-2,+
4R14M+6,+1R2M+4,+1L6D2R24M+12,-5
R5M+12,-5M+10,-4U2M296,71"
79 HDRAW"BM183,76M+5,+3M-3,+4M+4
,+2D2M+4,+2M-24,+3L8UM-4,-3M+4,-
3M163,81"
80 HDRAW"BM193,89R4M-2,-7U2L3M19
1,76BM193,89M202,89"
81 HDRAW"BM246,93M+6,+2R4D4R12M2
90,98BM310,96M-8,-2U3M-4,-2M301,
81"
82 HDRAW"BM323,95M+6,-4M+8,+2R17
M+3,-1R8M+8,-1M393,88"
83 HDRAW"BM459,88R12DM+12,+2R8U2
R8DR6M+8,-2R6M+4,-1R8M+20,-7M-30
,-1M-6,-4M+4,-2M-4,+1L8M-2,-2M+2
,-2R8UL4M-20,-4M-6,-2M480,56BM51
9,73M515,70"
84 HDRAW"BM519,73M+4,+2R8M+12,-1
M+3,-1M+28,-2D5M-16,+9M-20,+9M-3
2,+8M-8,-2U8M505,90"
85 HDRAW"BM268,99D3L14M256,99"
86 HDRAW"BM254,102D4NR2DM266,112
"
87 HDRAW"BM277,118R36M+7,+5M+16,
-1M+3,-2M+8,-1DR4D5R4D2L3D2R16R8
M+8,+1M+7,-1M+12,+3D2R8U4L8U7R12
M-4,-5L4U5M+8,-2U6L8M+2,-2E2H2M+
8,-3M418,91"
88 HDRAW"BM415,105R10U3R20U2M+3,
-2M446,89"
89 HDRAW"BM445,102M+38,+10M+2,-3
M506,102"
90 HDRAW"BM368,129D5L16D9M+10,+2
M-14,+1M-24,-1L48M+2,-6M+8,-5U5M
-3,-2U3M277,118"
91 HDRAW"BM362,145M+10,-1M+6,+1R
16M+4,-2M+3,-2M+4,-1R12U2M+8,-1M
+10,-1M-3,-1U2M+3,-1U6M415,123"
92 HDRAW"BM378,145DM+6,+2M+8,+3M
+12,+5M+4,+2R17M+10,-4U8R3M-3,-4
L16M417,140"
93 HDRAW"BM276,145D2M+12,+5M+8,+
6M+2,+5M+4,+5M+2,+3M+8,+2M+1,-2M
+4,+1DR16M+4,-1U8M-2,-8R9U8M378,
146"
94 HDRAW"BM337,164M+5,+4R8M+8,-2
M+4,-3R14M+6,+1R4UM+4,-4M408,158
"
95 HDRAW"BM312,173M+6,+5D6M+4,+3
M+12,+1M+16,-1R24M+12,-1M+16,-4M
+12,-5M+13,-5M+8,-4L15U3M+3,-1M+
5,-1M425,158"
96 HDRAW"BM524,138M+3,+6M-8,+4D5
M+8,+5M+5,+1M+16,-2M+10,-9M+4,-5
M+3,-5U5R4M+2,+1R2M-2,-6L3UL4M-8
,+5M-8,+3M-12,+1M524,138"
97 HDRAW"BM435,136R2DM+5,+1R3M+8
,+5M+2,-4M-4,-3M-3,-2U3M-6,-4M-2
,-1L2DM435,126"
98 HDRAW"BM448,131R6M+32,-2M+2,-
1M-4,-4U4M+4,-1M483,112"
99 HDRAW"BM121,97M+10,-1M161,92"
100 HDRAW"BM486,128R6DL3D10M-16,
+5M-16,+2M-8,+3M-4,+3M+3,+2M+4,+
5D3M-12,+3M-6,+1L6M428,163BM434,
166M435,168"
101 DATA48,MOROCCO,ALGERIA,TUNIS
IA,LIBYA,EGYPT,WESTERN SAHARA,MA
URITANIA,MALI,NIGER,CHAD,SUDAN,S
ENEGAL,GAMBIA,CONGO,GUINEA-BISSA
U,GUINEA,SIERRA LEONE,LIBERIA,UP
PER VOLTA,NIGERIA
102 DATAGHANA,TOGO,BENIN,CAMEROO
N,CEN. AFRICAN EMP.,ETHIOPIA,DJI
BOUTI,SOMALIA,MBINI,GABON,ZAIRE,
UGANDA,KENYA,ANGOLA,ZAMBIA,ZIMBA
BWE,NAMIBIA,BOTSWANA,SOUTH AFRIC
A,MADAGASCAR,MALAWI,TANZANIA,IVO
RY COAST
103 DATAMOZAMBIQUE,SWAZILAND,BUR
UNDI,RWANDA,LESOTHO
104 DATA136,23,200,28,245,19,280
,45,400,32,72,43,100,58,152,58,2
48,58,328,65,408,63,72,66,57,73,
300,100,75,78,115,79,85,86,95,91
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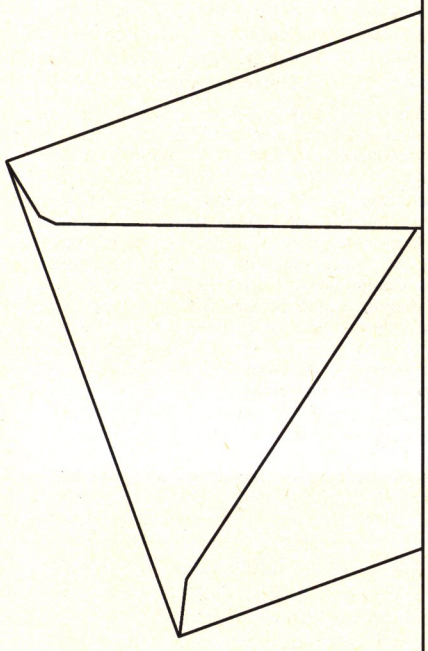

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,184,72,248,78,170,83,188,82,203
,75,278,85,344,86,488,78,515,71,
520,93,260,100,280,102
105 DATA360,108,426,101,472,103,
328,128,380,133,424,143,312,1148
,362,146,360,153,360,173,552,148
,440,136,456,113,136,83,472,133,
430,167,408,111,412,107,400,175
106 RETURN:DATAAFRICA,60,2,15,20
,5,16
107 REM***** AUSTRALIA/EAST INDI
ES *****
108 HDRAW"BM259,75D51L8M-5,+2M-1
7,+1M-7,+1M-4,+3M-27,-1D3L5M-5,+
1L15M-5,-2L2U2R3U6M-5,-6U3M-10,-
9R5D2R2M-5,-6U6R5M+15,-5M+15,-1M
+20,-3M+5,-3U3M+2,-2M+5,+3U3R5M+
7,-3M+10,-3M+6,+2D4M+2,-3M259,75
"
109 HDRAW"M+7,+3U5R3U3M+5,-2M+16
,-1M-5,-2M+3,-1M+4,+1R3DM+13,+1M
+6,-1D2R5M-7,+3M-4,+5M+8,+3M+12,
+3D30M259,112"
110 HDRAW"BM328,112R20D38M-8,-3U
3M-5,-1U2L6U2R2M-5,-3M-5,+3L5UR3
U2M+2,-6M-12,+6D3L6U3M-12,-6M-10
,-1M-5,-2M259,126"
111 HDRAW"BM328,82M+6,+1D2R10M+5
,-5M+2,-11M+7,-2M+3,+3M+1,+3R2D5
R2M+2,-1M+5,+2D6R4D5M+10,+3M+9,+
3M+5,+6R5M+5,+4M+12,+7D6M-7,+4M3
48,121"
112 HDRAW"BM423,119M+4,+1D5M-5,+
6M-9,+6M-7,+6M-5,+3M-3,+6M-10,-3
U3L12M-10,-4M348,136"
113 HDRAW"BM348,150M+10,+1M+7,+2
R5U2R7DM+10,+2M+10,-6M398,152"
114 HDRAW"BM370,158R5M+3,+2R8M+5
,-1R5D4M-3,+2D3L7M-1,+2M-10,-3U3
M370,158"
115 HDRAW"BM20,17M+10,+1M+10,+3D
2R5M+10,+5M+5,+2R4D2M+5,+2M+5,+2
R5D4R3D3M+7,+3D7L5M-3,+1M-7,-2M-
15,-6M-7,-6M-12,-6U2L6M20,17"
116 HDRAW"BM95,56M+2,-1M+10,+1M+
15,+1M+7,-2M+8,+1M+5,+3R10D3M-30
,-2M-20,-1M95,56"
117 HDRAW"BM120,27R10M+2,+1R3U4R
5M+10,-4M+10,-2R3UM+10,-4R5D2M+5
,+2R3DL7D2L5L12M-3,+3M-7,+8L17M-
7,+2M120,27M-3,+3M+2,+6R5D6R10M+
2,+2M+10,-1M+5,+2R10M+3,-7R5M+2,
-1M+2,-5R7M-10,-6R5M174,20"
118 HDRAW"BM195,30R30M+6,-2D3M-1
0,+2L20M-2,+1D2M+5,+1M+2,-1M+12,
-2DM-10,+2M+5,+5M+4,+3M-8,+1M-2,
-5L5D7L7U6M-2,-2M+2,-1M195,30"
119 HDRAW"BM282,35M+12,+1D4R2M+5
,+3R2M+12,-5M+20,+2M+4,+1D17M-5,
-2M-5,-1L3M-2,-2M-2,-1U2M-9,-3M-
10,-2L10U2M-10,-1M-3,+2M-4,-3UR7
U2L10U2L6M282,35"
120 HDRAW"BM339,41M+15,+2R5M+7,+
1M+7,+3DM+12,+1M-5,+2M+11,+6R5DR
2DR5D2M-12,-1L5M-14,-6L15D2M-5,+
2M339,58"
121 HDRAW"BM500,90M+10,+3M+4,+2M
+3,+1DM-2,+1M-10,-2M-5,-3M-1,-2M
500,90"
122 HDRAW"BM575,154M+5,-2M+3,-2U
3M-15,-9U3R3M+2,+2M+5,+2D2M+7,+2
M+2,-2M+2,+1D4M+5,+2R7M+3,-1M+5,
+1M-4,+2D3L5M-2,+1D2M-5,+1DM-7,+
3M-3,-6M575,154"
123 HDRAW"BM568,158R2DR7D4M-10,+
6M+3,+1M-3,+1M-3,-1M-7,+4M-7,+6D
M-5,+1M-5,-1L8M+5,-5M+10,-4M+10,
-3M+7,-3M568,158"
124 DATA16,WESTERN AUSTRALIA,NOR
THERN TERRITORY,SOUTH AUSTRALIA,
QUEENSLAND,NEW SOUTH WALES,VICTO
RIA,TASMANIA,SUMATRA,JAVA,MALAYS
IA,BORNEO,CELEBES,NEW GUINEA,PAP
UA NEW GUINEA,NEW CALEDONIA,NEW
ZEALAND
125 DATA200,110,290,93,290,117,3
80,105,380,124,350,143,380,164,6
5,33,135,59,155,26,155,36,195,40
,320,48,365,52,500,91,545,1177,5
90,153
126 RETURN:DATA"AUSTRALIA/EAST I
NDIES",8,20,55,5,55,8
127 REM*** S.E./S.W. ASIA ***
128 HDRAW"BM336,40M+2,-2R6U2M+11
,-1M+3,-1M+17,+3R16M-3,-3M+9,-4R
5M+7,+2M+5,+4R11M+9,+1R5D3M+24,-
1M+8,-2M+3,+1M+8,+1M-7,+4R13M+3,
+1D3L13M-8,+3L4M-3,+1M-11,+1D6M-
10,+1L15M-6,+2M-29,-5M-17,+2M-13
,-7L5M-11,-2U2M+2,-2M-3,-2M336,4
0"
129 HDRAW"BM286,92M+2,+4M+10,+3D
2M+2,+4M+26,+5R9U4R5M-1,+2M+2,+1
M+6,+1M+11,+1M+2,-2M+4,-2M+6,+1R
2UL2M+7,-3R8M+3,+2M-2,+3L4M-8,+4
R3M-5,+3L3M-1,+3M-5,-2M+1,-2U2L1
5M-2,-1L9DM-2,+1M+4,+3D7L9D3M-7,
+2M-26,+9M-2,+11M-3,+3M-5,+2"
130 HDRAW"M-3,+1M-3,-1M-10,-9U3M
-8,-5M-3,-9U8L3M-1,+2M-6,+2M-6,-
3U2R6U2L6M-4,-1M+9,-2R3U3M-4,-2U
2L6U3R8M+5,-3M+5,-2U2R3U2M+11,-4
M+4,+1M286,92"
131 HDRAW"BM298,99R7M+5,+2M+5,+1
M+3,+2M+7,+1M335,106BM341,109M+3
,-2R12M360,109"
132 HDRAW"BM340,124R4M+3,-1R2M+3
,-1UR5M+2,-1M+3,+5R2UM+2,-1M368,
119"
133 HDRAW"BM388,106M+7,+1M+5,+5D
2M-3,+1M-4,+4R4M+2,+2M+4,+2M-3,+
1D2R8M-3,+3L2M-3,+1L5M-3,+2M+2,+
5M+4,+1D2M-2,+2M+2,+2M+2,+5M-1,+
2M-2,+3L3M+1,-4M-6,-6M-7,-7M-5,+
3L8M+2,-2M-2,-3U3L3M362,125"
134 HDRAW"BM405,129R2M+3,+7M+8,-
1M+3,-1M+6,+1D3M+2,+2M-2,+3L8M-6
,+2M+3,+3M-5,-1L5M-5,+5D3R3D2R2M
+3,+3R5M+2,+1M-1,+2M-5,-1M-4,-2M
-11,-5M394,154"
135 HDRAW"BM406,160D4M+4,+4M+5,+
2M+2,+1R5M-2,-8M417,161BM142,112
L3U2R3
136 HDRAW"BM107,73M+15,-1M+6,-1M
+3,+1M+2,+7R5M+5,+2R13U3R5M+5,-1
R10M+1,+2R8M+7,+3R4M+1,+3M-3,+3M
+2,+1D8M+2,+2M-3,+4M+8,+5DR4DM-1
1,+3M-23,-2U5L8M-3,+2M-13,-3M-11
,-7L8M-3,-2U2M-12,-6M+4,-4M-9,-6
M107,73"
137 HDRAW"BM427,143R11D5M-8,+2DM
-4,-1M-5,+2L5M413,148"
138 HDRAW"BM421,152D2M-2,+2R4M+9
,-4M+14,-2U5M-2,-5M-7,-5UL2M-2,-
1M+5,-4M+5,-2M-4,-1M-4,-2L8M-7,+
3M+6,+2R2DM-2,+1M+9,+7M438,143BM
408,126R2DR2U2M420,127"
139 HDRAW"BM455,134R11M-3,+4L7M-
2,-1M455,134"
140 HDRAW"BM512,134M+8,+1M-3,+4M
-1,+2M+2,+2M+11,+3D3M-7,-2M-4,-1
L6U2M-1,-1U2M512,134"
141 HDRAW"BM516,118R4DM-2,+3M-6,
+5M-5,-2M516,118"
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142 HDRAW"BM560,95M+7,-1M+11,-4R
8M+5,+1M+4,-3U2R2DM+6,-1M+7,-7M-
2,-2U2R8DM+2,+1D3M-6,+4D8L7M-8,+
3M-5,-2L2M-7,+2L8M-13,+5L5M+2,-4
M560,95
143 HDRAW"BM607,70M+2,-4M+6,-2U4
M+4,+3M+8,+2R7D3L7M-3,+2M-7,-1M-
4,+3M607,70"
144 HDRAW"BM618,56M+2,-20M-3,-1U
7M+4,-1U2M+3,+1DR2D12M+6,+5DL2M-
5,-1M-2,+2D3M+6,+4M-4,-2M618,56"
145 HDRAW"BM534,81M+4,+1D3M-3,+1
M+9,+2M+4,-2R9U3M-7,-2M+11,-5U2M
+5,-3M566,71"
146 HDRAW"BM544,88M+2,+1D6M+11,-
1M+5,-3M-2,-4M557,86"
147 HDRAW"BM195,103R22M+7,-4R7U3
R8M+4,-5R5M+6,-10M272,76BM197,85
R11M+7,-2M+9,-3R9M+2,+1M+9,-2M+5
,-3M+6,+1M+2,+1M270,74"
148 HDRAW"BM196,113R25D2R3M+4,+2
M241,116"
149 HDRAW"BM107,73U2M+3,-1L4M-4,
-4L9M-7,+1L11M-15,-3L9M-11,+4L11
M-5,-3UM-7,+2M-2,+3M+5,-1M+7,+1D
L6M-4,+2M+5,+6M+11,+3R8M+6,-1R17
D2M+4,-1M+3,-1M+5,-1R18M110,78"
150 HDRAW"BM45,84M+5,-1M+4,+2M-4
,+1L3M45,84"
151 HDRAW"BM94,79M-5,+5M-2,+3M-1
1,+4M-11,+3L4U3M+4,-3M-4,-1M64,8
2"
152 HDRAW"BM130,98L8M-3,+1L11M-2
4,-6M76,91"
153 HDRAW"BM127,98D4L7M-6,+1M108
,99"
154 HDRAW"BM128,102M+7,+4R2M+6,+
5M+3,-2M+2,+1D3L6D3M+8,+1R8M+6,-
1R5D6M-6,+3M-12,+4M-19,+2M-15,+5
M-16,-8M-6,+1M-15,-9U3M-20,-17R6
M+9,-4M84,93"
155 HDRAW"BM148,113R12M+8,-3M+2,
+1D4"
156 HDRAW"M+5,+3R4M+9,+4M-6,+5M-
3,+2DM-25,+5M151,129"
157 HDRAW"BM117,136M-6,+3M-7,+1R
9M+36,-5M+5,+1"
158 HDRAW"BM95,129M+10,+11BM60,1
00M61,94"
159 HDRAW"BM60,100M-8,-7M+6,-3M6
1,94"
160 HDRAW"BM61,87L4M58,90"
161 HDRAW"BM300,155R7M+2,+2D5M-4
,+1L5M300,155"
162 HDRAW"BM443,127R9D5R4U4R11M+
7,-3R11M+5,-2R2M+2,-1R2M+6,-5M+2
,-1M+7,-4UM+3,-3L2U6M-6,-5L3M-2,
-2M+8,-5R8U2L11M-5,+2M-6,-5M+6,-
1M+11,-4M+2,-1R2M+3,+2M-7,+4R3M+
19,-4M+9,-5R8U2R6M+9,-3R7U6R8M+6
,-8M+4,-1U3M-14,+1M-4,-1M-6,-5"
163 HDRAW"L2M-1,-2L5M-6,-5U3M-7,
-8M-3,+1M-2,-1L11M-10,+2DR2D3M-5
,+3M-8,+3M482,39BM336,40L7M-5,+2
D5L11M-3,-1M-2,+5L6M-10,+2M+6,+7
L2D2M-17,+3D3L13M-3,+3R5M+2,+3M+
2,+2M+7,+2M+1,+2R2M+4,+1R17D2M-5
,+2D4M286,92"
164 DATA37,MONGOLIA,INDIA,NEPAL,
BHUTAN,BANGLADESH,BURMA,THAILAND
,MALAY,IRAN,KAMPUCHEA,VIETNAM,HA
INAN,LUZON,TAIWAN,JAPAN,SAKHALIN
,NORTH KOREA,SOUTH KOREA,AFGHANI
STAN,PAKISTAN,LAOS,TURKEY,CYPRUS
,SYRIA,IRAQ,KUWAIT,SAUDI ARABIA,
UNITED ARAB EMIR.,OMAN
165 DATAP.D.R. OF YEMEN,YEMEN,JO
RDAN,ISRAEL,LEBANON,CHINA,SRI LA
NKA,QATAR
166 DATA403,43,282,118,315,103,3
48,108,348,115,381,118,403,133,4
09,163,150,93,420,145,425,1126,4
27,151,460,135,514,136,518,120,5
80,1092,618,65
167 DATA623,42,545,78,550,88,216
,88,260,88,410,130,51,73,47,85,7
3,83,86,88,120,101,106,108,156,1
15,172,118,120,137,106,133,68,94
,58,93,61,89,403,88,303,157,145,
111
168 RETURN:DATA"S.E./S.W. ASIA",
10,5,60,20,10,2
169 REM***** WESTERN EUROPE ****
*
170 HDRAW"BM470,24M+3,-2M+7,-3M-
10,-2UR10M+7,-2M-18,-2M-5,+2L5M-
3,-2R5M-5,-3M-27,+2M-15,+5D3L5M-
10,-4M-22,+4M-20,+7M-20,+18M+5,+
2D2L8M-5,+5M-23,+10M-27,+5M-8,+4
D16M+10,+6M+3,+1M+10,-1M+15,-5M+
15,-1M+4,+3"
171 HDRAW"M+7,-6M+4,-1M-5,-4M+5,
-3M-7,-5U7M+7,-5M+10,-1U2M-4,-1M
+5,-9M+2,-2R3M+8,-6M+8,-3R5U4M+1
4,+1R7U5M+4,-1R5U2M+6,+1M+7,+4M+
12,+2M+2,-1M+10,+1M+5,-3R4U4M+7,
-3R8M470,24"
172 HDRAW"BM401,27M+10,+4M+10,+2
M+8,+7M+7,+11L18M-10,+7M+3,+3L4D
3M-13,+1D2M-16,+6M-4,+5M+8,+6M+7
,+2D3M-18,+7M-9,+9M-10,+2M-11,+2
L10U3M328,91"
173 HDRAW"BM436,51M+7,+1M+8,+3D2
M-11,+1M-15,+11D6M+2,+1D6M+6,+2R
8D2R10M+12,-2M+20,-1M+10,-6U2M+1
8,-4U2M-15,-5M-8,-9M+6,-3M-10,-8
M+8,-4M-10,-7M470,24"
174 HDRAW"BM123,113R14U2R4M-5,-2
UM+8,+1M-2,+4R14D9L12M-15,+3L3U7
M-6,-1M123,113"
175 HDRAW"BM144,109R3M+3,-2R6M+6
,+2DM+3,+2M156,113"
176 HDRAW"BM186,111M-16,+1M-3,-1
U2R3M-2,-7M-2,-1M-5,+2L6U4M+8,-4
U3M+3,-1M+8,+1M+12,-1D2M-10,+3M+
2,+2M+8,-1R15D2M-15,+5DM+12,+2DM
-10,+1M186,111"
177 HDRAW"D6M-12,+2D4L7M-3,+2M+2
,+1R6M+5,+1R10M+8,-1DM-8,+2M-10,
+2M-12,+2DM+10,-1M+6,+1M+5,-2M+9
,+1U2R30U2L5M-2,-2M+5,-3L10UR4M-
7,-4UM-8,-1M198,107"
178 HDRAW"BM297,113U3L2M-2,-2M+2
,-3M+9,-2U2M-10,+1UM+2,-1R5M+11,
-3R3M-3,+5DR4D2L4M-7,+3M+7,-1D4L
8M-2,+2M297,113BM316,105R10D4M-3
,+1M-4,+1M316,105"
179 HDRAW"BM289,120M-6,-1L10M-6,
+1M-8,+7M+20,+2M-3,-3M+10,-3M289
,120"
180 HDRAW"R11M+2,-2M-3,-2M297,11
3BM302,113M+13,+2DM+8,+1M-10,+14
M+22,+2D4M+9,+2D2L10M+4,+4L22M-7
,-2M-5,+2L15M+7,-5M-14,-2M-5,-3M
279,129"
181 HDRAW"BM323,117M+14,-1M+13,+
3D3M+6,+3D6M335,133BM184,127M-7,
-3M+5,-4M-3,-2"
182 HDRAW"BM350,119M+20,-3M+15,-
3R7M+5,+1R3M+1,+1M+7,-1M+2,+1R33
D3M+5,+2M-4,+3M+3,+2D6M+4,+1M-14
,+7M-17,-4M-12,+1UM-10,+1M-4,-1L
6M-5,-2M356,131"
183 HDRAW"BM259,127L7M-7,+2M+10,
+3M+12,+3M282,138BM277,132M267,1
35"
184 HDRAW"BM245,129L10M-5,+1D3L6
M-16,+3U2L9M+4,+4R4M-2,+1L17UL15
DM+20,+3M+15,+6M+5,+5M-6,-1M-5,+
7M+5,+2M+15,+1R25U3R20M+6,+1L5M+
12,-3M-4,-7M289,145"
185 HDRAW"BM202,159L18M-5,-1M-5,
+1M-13,-1M-12,+3M+4,+4R20DL5M-6,
+15R6M+5,+1D2M+6,+1M+10,-3R16M+1
0,-4M+8,-1M+2,-1M-5,-2M+12,-6M+2
0,-3M247,162"
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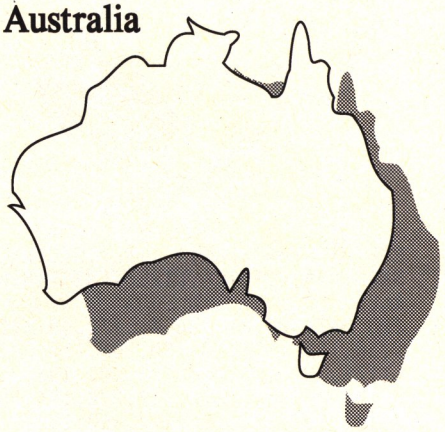
**Australia**



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186 HDRAW"BM153,165D7M-6,+2D4R8M
-6,+3M162,181"
187 HDRAW"BM437,188M+2,-1M+12,+1
M+2,+1DM-4,+1M-12,-1M437,188"
188 HDRAW"BM304,145M+5,+2M+2,-1D
2M+4,+2R5M-10,+3L10M276,150"
189 HDRAW"BM320,150M+20,+1M+25,+
1M+5,-3M-4,-2M+3,-1R7UM-7,-2M+3,
-1M-14,-2M-10,+1M344,139BM311,14
6M316,145"
190 HDRAW"BM437,138M-10,+3M-16,-
1M-10,+4M-2,-1M376,145"
191 HDRAW"BM427,141M+8,+1M-4,+2M
-15,+4M-10,+2M-13,+2M365,152"
192 HDRAW"BM435,142R10M+10,-1M+8
,-1M+15,+8D3M-3,+2M+3,+3R10D3M-4
,-1M-6,+6M-10,-2L10M-10,+2M-24,-
2U3M-5,+1L13U3L10M393,152"
193 HDRAW"BM424,162M-2,+6M+6,+1D
3M+15,-1M+10,+1M+5,-1M+12,-3UM+4
,-1M478,164"
194 HDRAW"BM428,172M-20,+2M-10,+
5M+12,+6D4M+8,+2M+8,-2M+10,-4U2M
-10,-2M-3,-4M+1,-1M+12,+2M+5,-1M
-2,-1UR20M458,171"
195 HDRAW"BM398,179M-5,-2U8R15D2
M408,174"
196 HDRAW"BM340,151M-5,+3R4D4M+4
,-2R5M+3,+3M393,171"
197 HDRAW"BM335,154M-10,+2D4M+8,
+2D2M+44,+11DL3M-10,-2M-2,+2R7D3
M-10,+4M-3,-1M+3,-1M-4,-5M-30,-5
M-17,-4M-5,-3M-10,-2M280,157"
198 HDRAW"BM325,184M+10,+1R10M+9
,-1D2M-2,+1D3L5M-3,-1M-20,-3M325
,184"
199 HDRAW"BM290,170M+8,+2DL4D4M-
5,-1M-3,+1M-5,-1U6M290,170BM290,
168U2M+3,-1M-4,-3M-4,+1L4D3M290,
168"
200 HDRAW"BM304,145M+5,-2M316,14
5"
201 DATA33,NORWAY,SWEDEN,FINLAND
,IRELAND,NORTHERN IRELAND,SCOTLA
ND,ENGLAND,DENMARK,NETHERLANDS,W
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EST GERMANY,EAST GERMANY,POLAND,
BELGIUM,LUXEMBOURG,FRANCE,SPAIN,
PORTUGAL,CRETE,SWITZERLAND,AUSTR
IA,CZECHOSLOVAKIA,HUNGARY,ROMANI
A,BULGARIA,GREECE,ALBANIA
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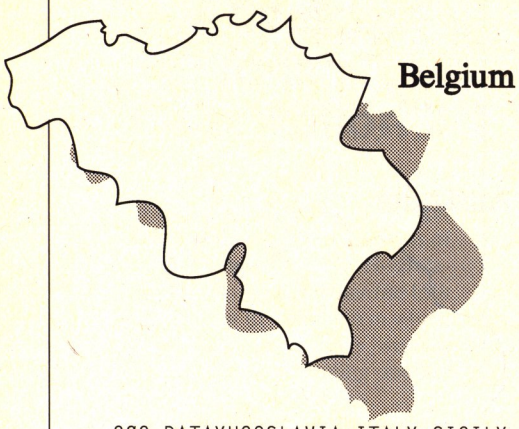


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202 DATAYUGOSLAVIA,ITALY,SICILY,
SARDINIA,CORSICA,LIECHTENSTEIN,W
ALES
203 DATA300,81,390,45,470,69,140
,120,152,111,180,100,200,120,305
,1105,325,108,270,123,305,135,33
0,123,390,123,270,132,272,134,25
0,147,190,174,150,177,450,190
204 DATA300,147,350,144,370,135,
400,147,450,149,470,165,420,178,
400,170,390,157,330,1153,373,175
,340,187,290,173,290,165,307,145
,180,126
205 RETURN:DATA"WESTERN EUROPE/S
CANDINAVIA",3,5,50,12,3,9
206 REM**** CANADA/ALASKA ****
207 HDRAW"BM164,52M-11,-3L11M-11
,-2L8M-13,-1M-7,+1M-11,-2M-3,-2L
5M-7,-1M-15,+3M-4,+2M-11,+2M-11,
+6M-11,+1D3M+11,+3M+16,+7L16U2M-
10,+2M-8,+2M+8,+1M-6,+1M+8,+3R18
D4L7M-23,+7M+11,+4M+4,+4R6M+3,-3
M+3,+6M+24,-2M-20,+10D3M+38,-11U
L4"
208 HDRAW"M+18,-9M+9,+2M-11,+1M-
4,+6R6M+15,-7R11M+26,+4M+23,+6R1
1M+11,+10M+11,+1U2M-20,-14L6M-4,
+2M-12,-4M164,52"
209 HDRAW"R14M+10,+4D10R15M+7,+2
D6M+10,+7DM+22,+6M+6,+5M165,93"
210 HDRAW"BM188,56R5M+21,-4R5M+1
1,-4M+2,+3R6U2M+3,-4R3M+14,+7M+1
1,-2M+31,+5R6M+5,+2M-8,+2DR22M+1
8,+8R2M-6,-7M+13,-4M+7,+3R6M+6,+
2D31M248,93"
211 HDRAW"BM371,62R17M+4,-3M+8,+
1D2M+4,+4R11U4M+4,-5M+11,-4M+7,+
2M+2,+6M+11,-4M+6,+2M+4,+6D4M+5,
+4M-6,+2M-2,+5M-10,-1M-6,+6M-11,
-1DM+6,+1M-10,+4M-6,+3M371,93"
212 HDRAW"BM207,111D6M+11,+6M+24
,+7R53M-28,-13U24BM285,130R36NU3
7R48NU37R33U11M+34,-14M-18,-2M42
0,93"
213 HDRAW"BM400,130M+31,+2M+11,-
2M+11,+2M+3,+4M+11,+1M+11,+4L7M-
11,+6R7M+13,-2M-5,-1M+26,-4UL11M
-15,-4U12M-13,-6U6M436,105"
214 HDRAW"BM475,123R5U11M+11,-4U
4M-9,-4U2R6U5M-3,-1M+4,-2U5M+22,
+1M+20,+6M+3,+2M-3,+5M+11,+2M+15
,-7M-3,+2M+4,+6D4M+2,+1D6L18M-3,
+6M+11,+2M+6,-2M+3,+1M+36,+1M-15
,+3M-50,+2M-22,+7DM+17,-4M+16,-2
D3L11M-11,+3M-10,+6M486,140"
215 HDRAW"BM557,94M+6,+2D2M+11,+
7D3M+22,+6M+7,+4D4M595,121BM602,
123M-14,+8M-4,+2R29M-3,-2M+3,-2L
9U2L4M-3,-2M+7,-7M602,123BM519,1
34R7M+3,+5R18M-11,+1M-3,+1D2R6M+
19,-4U2L6M-11,-2U3M530,131"
216 HDRAW"BM529,139M558,137BM549
,133R3DR10D2L15M-3,-1M549,133"
217 DATA14,ALASKA,YUKON,MACKENZI
E,KEEWATIN,BRITISH COLUMBIA,ALBE
RTA,SASKATCHEWAN,MANITOBA,ONTARI
O,QUEBEC,NEWFOUNDLAND,NEW BRUNSW
ICK,PRINCE EDWARD ISL.,NOVA SCOT
IA
218 DATA105,62,175,75,300,70,391
,70,248,106,303,110,336,110,391,
110,435,126,520,1114,539,130,567
,1118,604,132,535,138,550,135,55
7,138
219 RETURN:DATA"CANADA/ALSAKA",5
,17,50,5,5,20
220 REM***** U.S.S.R. *****
221 HDRAW"BM73,48M+5,+1M+8,-1M+3
,+2D2M+3,+6M-8,-1M-5,+1M-8,-3U2M
73,48BM86,48M+8,-2M+4,+1M-2,+4M+
6,-1M+5,+2D2M+2,+2M-9,+3M92,58BM
102,50M+7,-3R2M+4,+2M+4,+3M109,5
6"
222 HDRAW"BM71,55M-11,+2M-5,+2M+
7,+1D2M+7,+8M+11,+2M+3,-2R3M+2,+
2R4M+3,-5M+7,-2M100,59BM55,59M-8
,+3L2UL10DL7M+2,+6M+7,+4DM-14,+5
D3M+15,+2M+3,+5M-5,-1M-3,+5R4M+2
,+2M+6,+1M-3,-3M+4,-1M+19,+4R14M
+7,-2M-8,-8M+5,-7M80,72"
223 HDRAW"BM37,72R5D2M+2,+2M-4,+
2M-5,+2M-3,-2M23,78BM48,119D2M+3
,+3R2U3M48,119BM60,117R2M+3,+2R2
M+3,-2M+3,+4M+6,+1D3M-3,+2M+3,+2
M-5,-1M-14,+3M-2,-1M+2,-4M54,124
M+3,-2M-1,-1R3M-1,-2M60,117M-10,
-3M48,119"
224 HDRAW"BM103,129R6D4M+4,+2M+5
,+1M+2,-1R13M+5,+1D2M-3,+2M+5,+1
M+1,+2D2M+13,+10M-2,+3M-10,-2M-5
,+2L20M-2,-5M-5,-5M-5,-4M-10,-4M
-14,-1M+7,-6R3M+2,-1M-5,-2M+3,-2
M+5,+2R5M103,129"
225 HDRAW"BM113,135M+18,-10M+12,
+2M-7,+4DM+10,+4M+5,-2D2M+11,+3R
3M+3,+3D7M+7,+2M+10,-1M+9,-1DM-5
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13,-4"
227 HDRAW"L10M-6,-1M-12,+3M109,1
12BM157,160M+20,+1M+3,-1M+2,+6M+
12,-1D2M+5,+1R2M-3,-7M-23,-5UM18
5,154BM198,161M+5,-2R30M+10,-1M2
46,157"
228 HDRAW"BM390,63M+7,-1R13M+10,
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229 HDRAW"U15M+10,-5M390,63BM70,
117U4M-5,-2M-5,-4M-8,-4D7M-5,+2M
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30,+11M-7,+18R15U2R13M+16,+14M-5
,+16M-6,+8"
232 HDRAW"L20M-6,-5M+7,-2M-2,-11
M-18,+4M-6,-2L12M-20,-8L15M-10,+
4M+4,+1M-3,+9L23M-25,+6M-17,-3M-
12,+2M-20,-6M-6,+2D4M-25,-3M301,
141"
233 DATA16,LITHUANIA,LATVIA,ESTO
NIA,BELORUSSIA,UKRAINE,MOLDAVIA,
AZERBAIJAN,ARMENIA,TURKMENIA,UZB
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234 DATA80,56,95,48,110,50,80,62
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132,190,164,210,156,450,84,300,1
00,60,112
235 RETURN:DATA"U.S.S.R.",50,20,
35,5,35,2
236 REM**** CENTRAL AMERICA ****
237 HDRAW"BM20,46M+24,-2M+36,+4M
+36,+2M+4,-3R18M+26,+13R12M+9,-4
R8M+12,+4D2M+12,+5M+14,+3M+6,+2D
2M-6,+2D10M+26,+13M+9,+3M+36,-3M
+12,-7M+12,-2R24D4M-6,+2D3M-9,+3
M-12,+2M-18,-1M-10,+4M+5,+3L12M-
6,+3M-24,-4M-18,+3M-96,-16U8M-36
,-16L8U4M-44,-16M-16,-2"
238 HDRAW"D6M+36,+15M+12,+10R4M+
8,+5M-8,+2M-36,-16L8M-10,-4M+6,-
2M20,46BM282,113M+30,+6M+11,-2M+
4,-4M+8,-2M-2,-2M-6,+1M323,104BM
335,102D6M333,109BM323,117R18M+5
,+4M-14,-1M312,119"
239 HDRAW"BM335,111R48M+10,+3L9M
-26,+6M-2,+2M346,121M+19,+6R26M-
4,-4M+5,-4M393,114BM365,127D3M+1
4,+2M+20,+1M+5,-1M385,127BM404,1
32M+20,+4M+20,-4M+12,+1M+12,+6D4
L6M-6,-2U2M-14,-2M-6,+2M-4,+4L10
M-12,-4M-12,-1M379,132"
240 HDRAW"BM392,87M+24,-2M+24,+2
M+12,+2R8M+30,+7M+12,+2M-7,+2L28
U3M-14,-4M-35,-4M-20,+3L6M392,87
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,-2M464,104BM518,98M+17,+1NM-5,+
6R10M+3,+2R12M+10,+3DL12M-30,+1M
-30,+1U3R24M-9,-3M518,98"
241 HDRAW"BM588,104R12M-1,+3M-17
,+1M588,104
242 DATA13,MEXICO,GUATEMALA,BELI
ZE,EL SALVADOR,HONDURAS,NICARAGU
A,COSTA RICA,PANAMA,CUBA,JAMAICA
,HAITI,DOMINICAN REPUBLIC,PUERTO
 RICO
243 RETURN:DATA164,76,315,116,33
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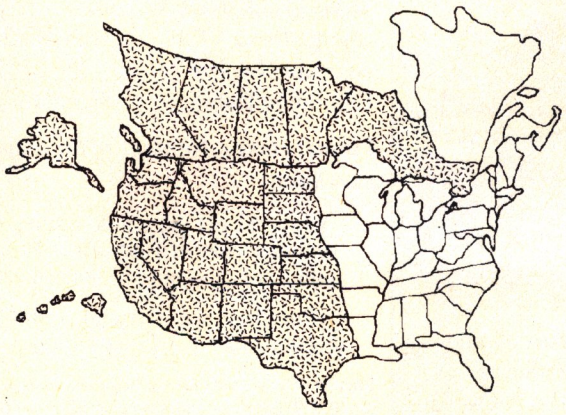

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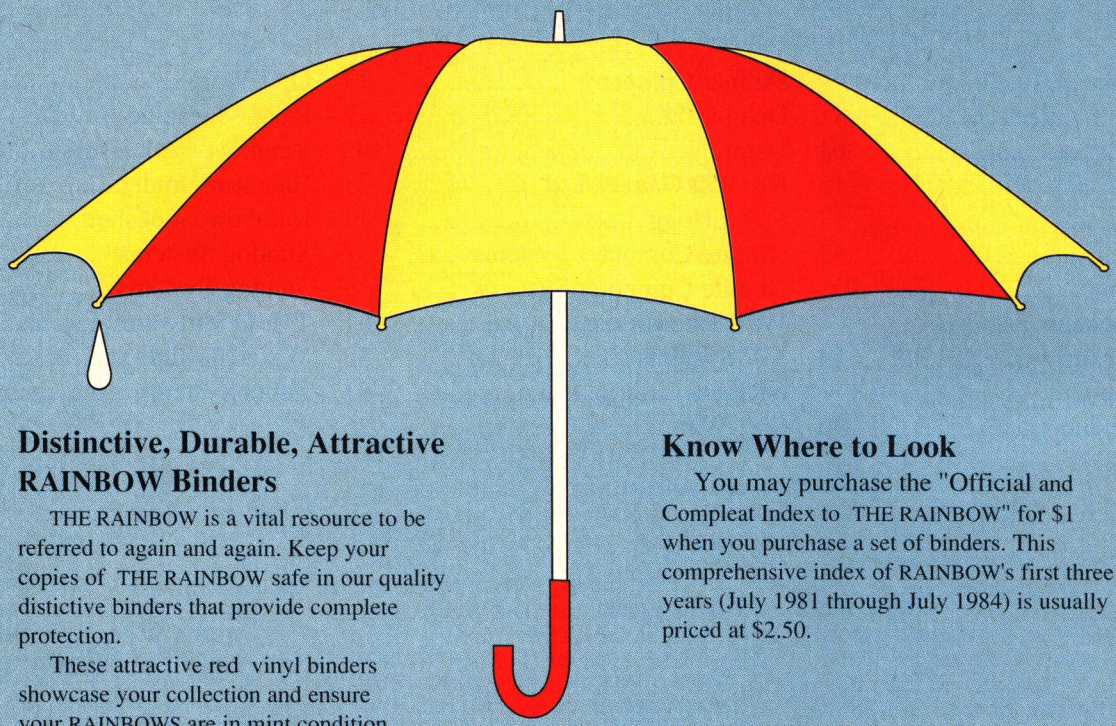

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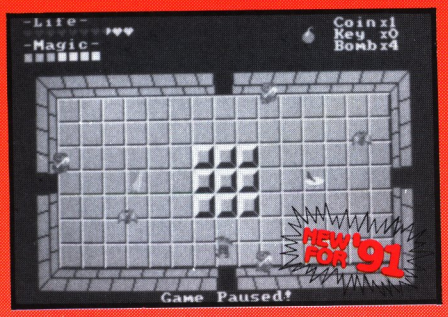


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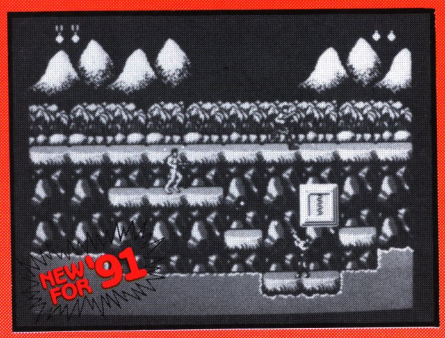


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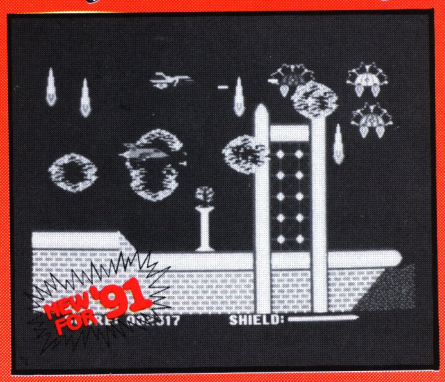


The superior technology of the evil Overlords has ensnared yet another innocent planet; however, this one contains the Crystal City, bastion of democracy and independence. Earth has had enough! Break through level upon level of their virtually invulnerable defenses, defeat the end guardians, and make your way ever closer to freeing the slaves of the Crystal City! This amazing arcade game is an achievement in its own right. Full 128K/512K utilization! Super fast horizontal hardware scrolling on the 128K computer! Wild digital sound effects and background music score! 30 minutes, or over 30 megabytes, of non-repeating 320x200 resolution, 16 color graphics! This game has it all; order a demo disk to see it first! Can you save the Crystal City from unbeatable foes? Req. 128K CoCo 3, disk drive, and joystick.

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